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QUALITATIVE TESTS FOR THE LIMIT OF IMPURITY IN CHEMICALS OF THE U. S. PHARMACOPŒIA.

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INTRODUCTION.

SEVERE criticism of the U. S. Pharmacopœia in certain points is not inconsistent with a very high estimate of its value as a whole, but judicious criticism tends to improvement, especially upon the eve of the decennial revision; and no strictures in this paper are intended to cast discredit upon the committees that have successively brought the work to its present degree of precision.

Qualitative tests are prescribed for many chemicals, with a repetition of detail again and again that would seem quite needless for any one with ordinary training in qualitative analysis; while volumetric and gravimetric processes are also employed (to say nothing of alkaloidal assays) which cannot be successfully carried out unless the examiner has had careful training in quantitative analysis. The work, as a whole, is written neither for beginners nor for experts; perhaps it was intended as a compromise for all classes of druggists and analysts. An attempt is also made to define the *limit* of certain impurities which may be allowed without detriment in the use of some chemicals; and when this limit is defined by qualitative tests, much greater precision might be gained by a uniform system of standards, while a great want of consistency is to be seen in those tests which are designed to exclude even traces of impurity, as illustrated below.

The Musk-Deer (see page 83).

DIRECTIONS NOW GIVEN FOR DETECTION OF SULPHATES.

In tests for sulphates, as prescribed for certain acids and ammonium salts, the following variations occur, where the intention seems to be to exclude in each case any easily recognized trace. Hydrochloric and nitric acids are each diluted with five volumes of water, while the amount of dilution required for lactic acid is not prescribed; of boric acid an "aqueous solution" must be used; of citric or tartaric, "10 C.c. of a concentrated solution"; ammonium carbonate, nitrate, and valerianate are to be acidulated with nitric acid, but ammonium chloride and phosphate with hydrochloric acid.

Various quantities of test solution of barium chloride are prescribed—as a few drops for acetic acid; 20 drops for hydrochloric acid; 1 C.c., with excess of hydrochloric acid, for citric or tartaric; a small portion for phosphoric, and some for nitric acid or ammonium carbonate and phosphate; while test solution of barium *nitrate*, in indefinite quantity, is directed in testing ammonium chloride, nitrate, and valerianate. In the case of acetic, boric, lactic, nitric, and phosphoric acids, and ammonium valerianate, there should be no precipitate; citric, hydrochloric, and tartaric acids should yield no precipitate within five minutes; ammonium nitrate no cloudiness; ammonium carbonate and chloride no turbidity; hydrobromic acid no turbidity or precipitate; while acidified ammonium phosphate "should remain unaffected"—although no method is prescribed to ascertain any possible change in thermal, optical, and electrical properties, viscosity, molecular volumes, etc.

Many of these variations may be explained by the peculiar habits of the contributors to the several paragraphs. Nitric acid may be used in some cases to facilitate the test for chloride with that for sulphate, and the extent of dilution prescribed for the stronger acids may be needless for lactic acid and for honey; but the distinction between cloudiness, turbidity, and precipitate is not clear, neither does any reason appear for adding the "test solution of chloride of barium with excess of hydrochloric acid" in testing citric and tartaric acids, while adding the nitric or hydrochloric acid first to ammonium nitrate, phosphate, etc. If needful to prescribe the details for ordinary qualitative tests, would it not be simpler for the next Committee on Revision to give the necessary directions once for all, and then simply to prescribe that acetic acid shall be free from lead, copper, tin, iron, calcium, nitrate, sulphate, and chloride, and shall conform to the other tests as described?

THE PRESENT QUALITATIVE TESTS FOR LIMIT OF SULPHATES.

Turning now to those tests in which a *limit* is prescribed for the amount of sulphate present, we find that they are to be made with "1-per-cent aqueous solutions" of magnesium, potassium, and sodium sulphites, "strongly acidulated with hydrochloric acid," where a "slight cloudiness" or "white cloudiness" may be produced by barium chloride, but (with the alkaline salts at least) "no precipitate" is allowable; sodium bisulphite is tested in the same way, except the solution must be "acidulated" instead of "strongly acidulated," and the limit is a "faint cloudiness." The distinction between a "slight cloudiness," a "white cloudiness," and a "faint cloudiness" is not very clear; neither is the difference between cloudiness and precipitate, unless the latter means such a quantity of insoluble salt as to collect quickly at the bottom of the test tube. If that is the real meaning, however, the word is not used consistently throughout the book; for the absence of a "precipitate" (not the absence of mere "cloudiness") is specified as the proof of the absence of sulphate in acetic, boric, lactic, nitric, and phosphoric acids, and in many salts. The tests for chromic and sulphurous acids are more definite, 1 Gm. of the former being dissolved in 100 C.c. of water, and one-tenth volume of hydrochloric acid being added in each case, followed by 1 C.c. test solution of barium chloride. A 1-per-cent solution is prescribed for sodium bicarbonate (either pure or commercial), but the more soluble carbonate may be made of any possible concentration. Two-per-cent solutions must be made (with the aid of acetic acid) in testing magnesium carbonate and the two alkaline acetates, but a 20-per-cent solution for honey; while no strength is prescribed for the aqueous extract from sulphurated antimony (with hydrochloric acid), nor for aqueous solution of ferric lactate, hydrochloric acid solutions of saccharated carbonate of iron and of potassium ferrocyanide, and for nitric acid solutions of soda, potassa, and potassium carbonate or bicarbonate.

Test solution of barium chloride is usually prescribed; but the nitrate (about one-half as strong) is directed for magnesium carbonate, honey, sodium phosphate and pyrophosphate. The varying quantities admissible are crudely indicated: "faint opalescence" in case of magnesium carbonate, honey, potassium acetate, sodium acetate, and sodium pyrophosphate; "slight opalescence" for sodium bicarbonate; "faint cloudiness" for magnesia, for solutions (liquores) of potassa and soda, and for sodium phosphate; "slight cloudiness" for potassa and soda (when the *solid* is tested); while a "slight turbidity" is allowed in potassium carbonate or quinine hydrobromate and hydrochlorate; a "trifling precipitate or cloudiness" in potassium ferrocyanide; a "slight precipitate" in quinine valerianate; a "trifling precipitate" in sodium carbonate, and anything less than an "immediate precipitate" with the commercial bicarbonate.

Probably few chemists or druggists have suspected the amazing complexity of detail in the official directions for applying this common test, one of the simplest and easiest in the whole range of qualitative analysis. Since no clear distinction is made between the essential and the non-essential, the analyst who takes this book for his guide will be likely to regard all details with some indifference, make up his solutions according to his own convenience, and suffer some bias of judgment in discriminating between cloudiness and precipitate. The reasons for the discrepancies are not far to seek, when we consider the multitude of workers whose various tastes and habits here find expression. A marked individuality is seen in tests for purity of the alkaline bromides and iodides. The formula for potassium and sodium bromides and sodium iodide reads thus: "On adding to 1 Gm. of the salt, dissolved in 20 C.c. of water, 5 or 6 drops of test solution of nitrate of barium, no immediate cloudiness or precipitate should make its appearance (limit of sulphate)." The direction is modified for ammonium bromide only by substituting barium chloride for the nitrate; for ammonium iodide, by adding the parenthesis "(with a few drops of diluted hydrochloric acid)"; potassium iodide (if there is no misprint) must be dissolved in 30 C.c. of water; and the formula for calcium bromide differs only by substituting the word "sulphate" for "limit of sulphate" in the final explanation. The habit of verbal precision which marks these paragraphs may be due in part to the tests for limit of chloride, which require the use of volumetric solution of silver nitrate. The test for limit of sulphate in these salts (as well as for foreign halogens in the alkaline iodides) depends upon the slow rate of chemical action in very dilute solutions; and the needless introduction of *time* as an essential element of the test is undesirable. If the prescribed quantity of barium solution is carefully dropped out from the reagent bottle in making the test, the word "immediate" will imply a much shorter time with an expert manipulator than with a novice.

A PLAN SUGGESTED, BASED UPON THE USE OF DILUTE STANDARD SOLUTIONS FOR COMPARISON.

The object of this paper is not to find fault with the tests as now officially prescribed, but to suggest an improvement.

Both volumetric and gravimetric processes are prescribed in many articles of the Pharmacopœia, but the needless extension of these would detract from the popular character of the work. Any revision of the present method of testing should conform, where practicable, to existing usage, should require as few additional appliances as possible, and should prescribe essentials only, while recommending in detail whatever may subserve the convenience of the operator. I propose, in all the ordinary qualitative tests for impurity (except where mere traces are to be excluded), the following essential features:

1. A solution of the chemicals to be tested, of known strength.
2. A *dilute standard solution*, reacting like the impurity to be limited.
3. Direct comparison of the two solutions, so conducted as to allow a careful judgment of the relative intensity of the two reactions.

Let us now consider the most convenient method of carrying out these essentials in the average drugstore, for which the work is designed.

In preparing solutions of the chemicals to be tested, a strength of 1 per cent is now prescribed in so many cases that this may be regarded as the rule, exceptions being indicated where necessary. The solution of 1 Gm. made up to 100 C.c. should be regarded as a sufficiently accurate approximation for the qualitative tests.

The standard solutions for comparison may be prepared by suitable dilution of the "test solutions" of the U. S. Ph., if these are carefully made. Under the present directions, 1 part of the solid is usually dissolved in 10 parts or in 20 parts of the solvent; test solution of potassio-cupric tartrate alone (about $\frac{35}{1000}$ normal) contains a given weight of salt, made up to a given volume. The system of making up to a certain volume in each case would seem most convenient, unless measuring flasks are rare among druggists; but this is a practical point which others must decide.

The present test solution of potassium sulphate contains one-sixteenth by weight of salt, or about 34 Mgm. of sulphion in each C.c.; while the 1-per-cent solution contains 10 Mgm. of salt in each C.c. If 1 C.c. of such test solution is diluted to 340 C.c., it would contain 0.1 Mgm. of sulphion in each C.c. If equal volumes of the two solutions (treated at the same time with equal volumes of solutions of barium) give like precipitates, the salt contains not far from 1 per cent of sulphion, probably a larger amount than will be allowed in any chemical, if the requirements of the new Pharmacopœia keep pace with the progress of manufacture. The formula for a given chemical might read: "a 1-per-cent solution must contain less sulphion than an equal volume of dilute standard solution"; or, for a higher standard of purity, a 2-per-cent solution, 5-per-cent solution, etc., may be specified.

Further details of the plan can be worked out to better advantage after the Committee on Revision have determined what degree of purity shall be required for the official standard.

In case of acids the precipitation may be hindered; these may be nearly neutralized before diluting to the requisite volume, if special experiments prove this to be needful.

Finally, in making the comparison of the two solutions, two modifications of method have been tested. One is to use test tubes of like size, and note precipitate by transmitted light. It is most convenient to stand a few feet from a window and look at a horizontal bar of the sash through both tubes; a difference in opacity is then easily seen. Similar results are obtained by holding a pencil or the finger horizontally behind both tubes, but care must be taken to hold it equally distant from both.

Perhaps a more satisfactory method of comparison is the use of two small beakers of the same size, containing 10 to 30 C.c. of each solution (making the fluid 1 to 3 Cm. in depth), and placing these upon a printed page. That of the U. S. P., with its variety of type, is well adapted for the purpose, and it will usually be found that some of the letters can be seen more distinctly through one of the fluids than through the other.

To complete the proposed system, it will be needful to agree upon the strength of the dilute standard solutions. A selection from the "test solutions," diluting about 1, 2, or 3 C.c. of each to 1 liter, may prove convenient.

ADDITIONS TO THE PHARMACOPŒIA.

In order to present the objects of this paper in more concrete form, the following matter is suggested for the revised Pharmacopœia, with the recommendation that details be subjected to a rigid investigation, under a committee of competent analysts, before their final adoption.

Add to the "Preliminary Notices," page xli., as follows:

Qualitative Tests for Impurity of Chemicals.

These tests are of two kinds: First, to show that all traces are absent (such, at least, as may be recognized by the usual methods), and, second, to show that traces, if present, do not exceed the limit fixed by the Committee. The analyst is expected to understand the general principles of qualitative analysis, as set forth in the ordinary text books on this subject, and to conform to their requirements. The directions here given are intended to indicate the degree of precision expected in the exclusion of impurity, and are based upon the judgment of the Committee regarding the standards practicable in the present state of chemical industries.

The following conditions must be observed (so far as they are applicable), except as modified by special requirements printed elsewhere:

Solution to be Tested.—This shall contain not less than 1 per cent (or 1 Gm. per 100 C.c.) of the solid substance to be examined. Fluids may be diluted to 5 volumes. Strong acids may be partly neutralized, and salts may be acidified (as may be needful in special tests) previous to such dilution.

Quantity of Reagent Used.—Test solutions may be added, amounting to one-tenth of the volume of solution tested: 10 C.c. and 1 C.c. are recommended in most cases, when traces are to be excluded.

Definition of Precipitate.—Any perceptible cloudiness or opalescence appearing within ten minutes after the addition of test solution, when examined in good light, will be regarded as a precipitate; and the chemical shall be deemed impure, except when a special "limit" is fixed as the standard.

Dilute Standard Solutions.—This new class of reagents is designed to aid in fixing the limit of impurity, and they must be made with care to contain the prescribed proportion of each reagent. When prepared by diluting "test solutions," these also must be made of the exact strength named. They will be indicated by the following brief designations:

Solution A: Made by diluting 1 [2, or 3] C.c. test solution of potassium sulphate to 1 liter; used in testing for limit of sulphate and alkalies.

Solution B: Made by diluting —— C.c. test solution of barium chloride with pure distilled water to 1 liter; used in testing for the limit of alkaline earths and chlorides. On adding test solution of silver nitrate to "Solution B," the opacity should not perceptibly increase in diffused daylight after the first minute.

It may be desirable to add others, as:

Solution C: Containing magnesium sulphate, for tests of magnesium and sulphates.

Solution D: Containing sodium carbonate or potassium bicarbonate, for tests of carbonates and alkalies.

Solution E: Containing ferric chloride, to test for iron.

Method of Testing for Limit of Impurity.—The essential point is to make a direct comparison (under like conditions) of the solution under examination with an equal volume of the "dilute standard solution." The reaction for impurity should always fall below that of the standard. For tests which depend upon precipitation, equal volumes of the two solutions are to be placed in similar vessels, and equal quantities of the reagent added to both.

Either of the following methods may be used; the first being the simpler, while the second admits of nicer distinctions. Care must be taken to have the vessels equal in size, and especially to observe through layers of equal thickness. If the opacity rapidly increases, the reaction should continue until no further change is apparent.

First Method: Mix 10 C.c. each of the two solutions with 1 C.c. of test solution in test tubes; observe a horizontal bar through both, and note which fluid is the more opaque.

Second Method: Mix like portions (20 C.c. each) with test solution in two small beakers, and place these on a sheet of test type; note the smallest letters that are legible through each.

The Estimation of Urea by Means of Hypochlorite.

Mr. D. B. Dott recently presented the following paper on the estimation of urea to the Pharm. Society of Great Britain (after *Pharm. Journ.*):

Of the various methods which have been proposed for the estimation of urea, that which enjoys most favor as an expeditious and sufficiently accurate process is the hypobromite method. Urea and hypobromite react according to the general equation: $COH_4N_2 + 3BrHO = CO_2 + 3HBr + 2H_2O + N$. A strong alkaline solution is employed, whereby the carbonic anhydride is absorbed, so that it is only necessary to measure the volume of nitrogen, and, after the usual corrections, to calculate its equivalent of urea. The calculation shows a constant deficiency of very nearly 8 per cent of the urea actually present.

Different forms of apparatus have been suggested for conducting the operation, a useful modification being described by Mr. Gerrard. Mr. A. H. Allen advised the adoption of the nitrometer for the purpose, and that is the arrangement which I have employed. I have not, however, used hypobromite, but *hypochlorite*, and that is the point which I wish to bring forward. The solution of hypochlorite is easily prepared by mixing *one* part of chlorinated lime with *three* of water, and filtering. The nitrometer is now filled with this solution, and a measured quantity of the urine (say 4 C.c.) introduced by the funnel, any small amount adhering to the sides being washed in with a few drops of distilled water. The tube is now turned over twice from its perpendicular position, in order to mix the liquids, and in a few minutes the reaction is complete. It is well to introduce a little baryta solution to make sure that all the carbonic acid is absorbed, and then a few drops of methylated spirit to remove the froth and permit the reading to be accurately made.

The following results were obtained. With hypochlorite solution 2 C.c. urine gave—

(a)..... 21.6 C.c. nitrogen.
(b).. ..... 21.6 " "

A solution of pure urea was prepared containing 2 Gm. in 100 C.c., and 4 C.c. of the solution treated with the hypochlorite solution:

(a)..... 29.0 C.c. nitrogen.
(b)..... 28.8 C.c. "
(c)..... 29.0 C.c. "

Twenty-nine C.c. nitrogen, after making the necessary corrections, are very nearly equivalent to the 0.08 Gm. urea used. These results indicate that the hypochlorite of calcium is as trustworthy a reagent as the hypobromite of sodium. But, it may be asked, does the former possess any advantages over the latter? I decidedly think so. In the first place, the hypochlorite of calcium solution keeps unimpaired for a considerable time, while the sodium hypobromite rapidly deteriorates and becomes useless. Secondly, the hypochlorite solution is easily prepared, while the hypobromite solution is rather troublesome and disagreeable to make, especially where there is not a good draught. Lastly, the hypochlorite solution is much less costly than the sodium hypobromite.

THE MUSK DEER.*

The Berlin Zoological Garden has come into possession of the first living specimen of the male musk deer which has ever reached Europe. Dr. Heck, the director of the Garden, obtained it last year, by purchase, from W. Jamrach, the well-known importer of animals, etc., of London. On looking at the little animal when lying in its cage, it appears like a puny fawn of dark chocolate-brown color, with a few indistinct but lighter stripes and spots upon the rump, and a somewhat grayish head ending in a peculiar broad snout. When it is at liberty, however, its movements and actions are so singular that it seems to many visitors to have a resemblance to a kangaroo. A favorite position of the animal is to sit upon its haunches, curving the back very considerably, and placing its fore feet far between its hind feet. Frequently, after remaining in this position for a long time, it suddenly twists, lifts and turns the fore part of its body in a most astonishing and almost incredible manner, jumps to and fro, and suddenly perhaps assumes the rôle of a beast of prey cautiously sneaking or prowling. Its small, long, and pointed hoofs are placed flat on the ground, and the fetlocks are so low that they touch the ground likewise. No illustrations which have heretofore appeared, and which have been made after museum specimens, do justice to the animal. No doubt its agility, build, and manner of movement are closely connected with the features of the rugged and mountainous regions of its habitat, which extends throughout eastern and central Asia at an elevation about equivalent to the snow line. The male animal is distinguished from the female particularly by having protruding tusks, like those of a boar; on the other hand, there is not a sign of antlers noticeable.

The illustration accompanying this note is taken from the *Illustrirte Zeitung* (Leipzig), No. 2434.

Tincture of Musk.

The U. S. Pharmacopœia directs that tincture of musk should be made of 10 parts of grain musk extracted with dilute alcohol to yield 100 parts of tincture. The officinal musk is pure grain musk, which in recent years has ranged in price from $20 to $35 per ounce, making a tincture prepared by this process cost from $30 to $50 per pint. It is charged that the amount of menstruum used is not sufficient to exhaust the musk, and the process is consequently extravagant and wasteful of this expensive drug. To show the truth of this, 1 Gm. of musk, treated by the officinal process, yielded 20 per cent of extractive. The residue again treated with the same amount of menstruum yielded a tincture with 6 per cent of extractive, and a third maceration gave a tincture still containing a considerable amount of odorous matter.

The writer suggests that the process be revised so as to give a strength of 8 grains per fluidounce with diluted alcohol as a menstruum. This tincture would be nearly identical with the Ger. Pharm. tincture.—G. M. Beringer, *Am. Jour. Pharm.*, April, 1890.

The Behavior of the Cinchona Alkaloids towards Xylol and Mayer's Reagent.

A. J. Swaving and A. Hilger have had occasion to investigate the solubility of the four principal cinchona alkaloids in xylol (boiling point 136–139° C. = 277–282° F.; mixture of para- and meta-xylol), and have found the following rates:

1 part of	At 15° C. is soluble in — parts of xylol.	At 138° C. is soluble in — parts of xylol.
Quinine	909	155
Quinidine	211	8
Cinchonine	7407	170
Cinchonidine	2222	7.8

The temperature 138° C. happened to be the boiling point of the xylol used in these experiments.

Though the authors make no further statement regarding the application of the above data, it is evident that a method of separation of cinchona alkaloids can be based thereon.

The authors have also studied the ratio existing between the four alkaloids and Mayer's reagent (an aqueous solution of 13.546 Gm. of mercuric chloride and 49.8 Gm. of potassium iodide diluted to 1 liter):

One cubic centimeter of Mayer's solution corresponds, respectively, to

0.0106 Gm. Quinine.
0.0092 Gm. Quinidine.
0.0079 Gm. Cinchonine.
0.0091 Gm. Cinchonidine.

—*Mittheil. a. d. pharm. Inst. Erlangen*, ii., 282.

* See page 81.

The Botanic Gardens at Kew.

It is now about two hundred years—the exact date is not known—since Lord Capel laid out the garden that has become a scientific institution of world-wide fame and influence. Switzer says, in his quaint "Iconographia Rustica," 1718: "The earliness with which this lord appeared in gardening merits a very great place in my history, and a better pen than mine to draw it." On the death of Lord Capel in 1696, the estate of Kew House, including the Garden, passed into the hands of his son-in-law, who added to its importance for a while by making it the headquarters of English astronomy. It was afterwards leased by Frederick, Prince of Wales, son of George II. The Garden was made a scientific establishment—what they called a "Physic Garden" in those days—by the widow of Frederick, the dowager Princess Augusta, under the advice of the Earl of Bute. She employed William Aiton to direct the scientific work, and Sir William Chambers to direct the decorative gardening. "Science will ever be grateful to the one," says a writer in the *Saturday Review*, "and Taste will never forgive the other while his constructions remain." In 1768 Sir John Hill published a catalogue of the plants at Kew. There were fifty ferns, about six hundred trees and shrubs, and several thousands of herbaceous plants. The list was not greatly lengthened twenty-one years after, when Aiton issued the "Hortus Kewensis" with the aid of Dr. Solander. But the collections made by Sir Joseph Banks in Captain Cook's famous voyage were deposited here; then those of Robert Brown and Allan Cunningham, who had accompanied Captains Flinders and King respectively to Australia; then the plants of Brazil and the Cape of Good Hope, gathered by Messrs. Bowie and Masson; those of Caley, and Kerr, and Menzies, and a host of smaller collections. In 1810 William Aiton, the younger, published a new edition of his father's work, which contained nearly 10,000 descriptions. About 1789 the estate was bought by George III., who devoted much of his leisure to its improvement. But evil days followed the death of Sir Joseph Banks, in whom Kew had a friend at court. For all Aiton could do, the Gardens sank into neglect, and in 1838 it was proposed to disestablish and disendow them. A protest was raised, and, after further consideration, the Gardens were surrendered by the crown and became a national establishment in 1840. Sir W. J. Hooker was appointed director in the following year. Kew has been fortunate in having had few changes in its directors. It was in charge of William Aiton from 1759 to 1793; of William Aiton, Jr., from 1793 to 1840; Sir W. J. Hooker was director from 1841 to 1866; his son, Sir Joseph D. Hooker, from 1866 to 1886; and to him has succeeded Mr. W. T. Thiselton Dyer.

Under the directorship of Sir W. J. Hooker the Royal Botanic Gardens rapidly advanced in importance. During his term of office a report of the Progress and Condition of the Gardens was made annually. This was superseded in 1883 by a monthly Bulletin of Miscellaneous Information. The early reports of Sir William Hooker are interesting, besides their historic and scientific value, for the evidence they give of his sturdy, ceaseless battles with the Treasury. The director is pathetic, indignant, and argumentative by turns, and one way or another he continued to worry on till better times. In 1844 Sir William took the first important step of his administration by petitioning for a grant of the Royal Fruit House, which he offered to fill with his private collection of plant products. It was allowed in 1847, and thus the Museum of Economic Botany had its origin. This branch of the establishment now occupies three buildings. Every tree and plant which is known to serve a useful purpose is represented there, with illustrations of the manner of its employment, if possible. While the collection is very popular with the holiday visitor, who comes only to be entertained, any one can understand its serious value to an ingenious and thoughtful mechanic or manufacturer. The Museum of Timber is largely used already. Cabinetmakers and furniture manufacturers quite recognize by this time what a store of hints for their craft is garnered here. The utility of the Economic Section, moreover, is by no means confined to the inhabitants of the British Isles. From every quarter of the globe samples of new products are sent for examination and report.

So long ago as 1815 an Herbarium and Botanical Library had been projected at Kew. George III., doubtless persuaded by Sir Joseph Banks, even raised a building for the purpose. After Sir Joseph's death, however, the scheme lapsed, and the building was granted to the King of Hanover. On his decease, Sir William Hooker urged the fulfilment of the old design, and his petition was granted when Mr. Bentham and Dr. Bromfield bequeathed their collections to the nation. The Herbarium of Kew is the largest in the world, and by far the most useful, because it is also most admirably arranged. The number of specimens in it is not on record. At Sir William Hooker's death, twenty-four years ago, a rough estimate made the number a million, exclusive of duplicates. The written catalogue fills two gigantic volumes, and has to be continually posted up, for the collection increases by twenty thousand or so yearly. The dried plants in their portfolios stand in cases, and all are arranged upon the system of Sir Joseph Hooker's great work, the "Genera Plantarum." The student has only to give the number attached to any genus in that book, and the case is unlocked and the portfolio laid before him in a moment. There are no formalities to check the young scholar here. He has but to present his credentials to Prof. Oliver, keeper of the Herbarium, sign his name, and get to work. There are interesting features at every step of this noble collection, fascinating bits of history connected with every group of cases which bears the name of some distinguished botanist, the fruits of whose life-long labor are stored here. Of all these perhaps the herbarium of Dr. Lindley is the most attractive. It occupies only four small cabinets, but the contents will surpass the visitor's utmost expectations. On the lower floor is preparing the catalogue of all plants known, for which Mr. Darwin left a bequest. Mr. Dayton Jackson, Secretary to the Linnæan Society, has had the work in hand over three years, and it is not nearly finished. He employs a staff at the British Museum also. The catalogue of the library is not printed, but is contained in a ponderous manuscript volume in the keeper's room.* The books include, besides all modern volumes and pamphlets on botany, a great number of those antique curiosities which bibliomaniacs treasure.

The work at Kew covers a vast field. In the first place, officially, stands the botanic interest—to study new plants and class them. Next, where plants are wanted for cultivation which cannot be obtained readily in the market or which the service of the public demands, the Royal Gardens will supply them, if possible. Where diseases or vegetable or animal pests threaten local plantations, Kew will look into the matter and consult with experts at home. Kew is ready also to report and to obtain advice upon new industries which those upon the spot suggest. Furthermore, it keeps an eye on all institutions of the same class throughout the British Empire, which act in concert with their great model in the mother country, and through it with one another. Foreign institutions co-operate in like manner with Kew to a certain extent. From time to time the authorities at Kew publish a list of new plants, which at present seem to average five hundred to six hundred a quarter, including those renamed for scientific purposes. From time to time, also, it publishes a list of the seeds matured in the Royal Gardens, which are exchanged, on application, with all regular correspondents. One of these seed lists includes something like four thousand species. This magazine of seeds is collected, nominally, for the benefit of institutions which may be able some time to return the favor in part, but in practice no one who applies with a serious purpose for seeds or plants is refused. How the rapidly increasing population of the globe is to be provided with food and clothing is a problem which the authorities of Kew believe falls within their department. They welcome every vegetable product which is reported to have qualities that make it useful to mankind, whether as a food, a medicine, a convenience, or a substance useful in manufactures. They are glad to report upon specimens of such substances, or to obtain the reports of trustworthy experts.

The story of the cinchona plantations is a good instance of the work of the Royal Gardens. Some forty years ago both the English and the Dutch authorities in the East Indies took alarm at the growing price of quinine, due to the rapid decrease in the forests of cinchona in Peru. The Dutch moved first, and imported a great number of seeds and seedlings, which they planted in Java at a heavy cost. But, probably because they had no Kew to advise them, the Dutch had chosen a species which was hardly worth growing, and the plantations have long since been uprooted. For some years the English government confined itself to importing seeds and plants, which died on the passage to India. This was evidently futile, and Sir William Hooker urged a systematic procedure. Mr. Clements Markham in 1859 was sent to Peru to collect seeds and young trees. When he returned, his precious stores were received at the Gardens, nursed, and transmitted to India with trifling loss. This effort was successful. In the plantations of Bengal, laid out and managed by officers recommended by Sir William Hooker, there were, at the date of the latest report, about 5,000,000 trees. From Kew cinchona trees have been distributed also to all parts of the world where there was a chance for successful cultivation. The plantations of Ceylon are only inferior to those of Bengal. In Jamaica the sales of bark exceed £5,000 a year. The tree has been introduced also into St. Helena, Trinidad, Mauritius, Cape of Good Hope, Queensland, and many other settlements. The output of the cinchona drugs from these sources up to 1880 was 87,704 pounds, which, taking quinine at an average value of $2 an ounce, would represent $2,806,527.

Ipecacuanha is a plant scarcely less important than cinchona itself. But few members of the vegetable kingdom so absolutely refuse to exist under anything short of perfectly satisfactory conditions. In 1866 Sir Joseph Hooker sent a specimen to the Botanical Gardens at Calcutta, which promptly died. Then a struggle began in which the advantage was now on one side, then on the other. In 1875 the director of the Calcutta Gardens tri-

* This is a specimen of British conservatism which can find few admirers in this country, where the card catalogue is in such general use.—Ed. Am. Drugg.

umphantly reported that he had 100,000 nice young plants, but in 1886 the strain received from Kew direct alone survived—less than 5 per cent—and all hope of successful cultivation in India has been abandoned long since. Plants had been sent out to Singapore, however, in 1875, with much more lively confidence, and there perseverance found its reward. Ipecacuanha is established in the Old World at last, and the authorities of Kew may be trusted to diffuse the cultivation. Another instance is Liberian coffee, distributed from Kew to take the place of that grown in the East Indies, which was affected with a fungoid pest, and that of the West Indies, which suffered from the white fly. Liberian coffee, moreover, will thrive in hot and moist situations, where the Arabian variety is unable even to live. It has been introduced in a great many places; but, although its growth is very promising, it has nowhere become the general crop. This imperfect success was another problem for the investigators of Kew, and the solution is now believed to be found in the fact that the treatment proper for the Arabian berry after gathering is not suited to the Liberian with a widely different pulp.

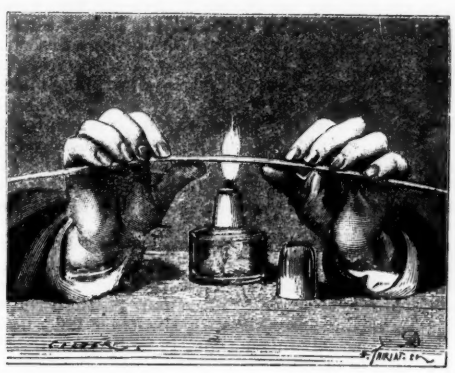
Among the many questions sent to Kew from all parts of the world, there must be some of trivial importance, or which could be perfectly well answered at the local botanic gardens; but all genuine inquiries receive attention. Debate has been gravely held, opinions even have been formed and reported, upon such matters as a South African cane which some gentleman in those distant parts thought adapted for fishing rods; upon the value of West African palm kernels as material for coat buttons; upon a pithy stem which the government of a West India island believed suitable for razor strops.

One function of a national institution very seriously regarded at Kew is the training of young men to fill botanic situations in the colonies. Something is demanded of such young men beyond the practical knowledge which suffices at home. Instruction is given them in the principles of scientific botany and those general conditions which rule the practice of horticulture under differing circumstances. The advantage of this system all around scarcely needs illustration. While serving the interests of the colonies it increases the sources of information for Kew, since all these emigrants keep up more or less of a correspondence with the institution in which they were trained.

The village of Kew lies on the south side of the Thames, about six miles westward from Hyde Park Corner in London. "The Gardens" are a favorite resort for holiday-makers and tourists, being visited by six or seven hundred thousand persons yearly. Painters also flock there in summertime. When the crown surrendered its rights to them in 1840, the Gardens had an area of eleven acres and contained ten greenhouses of one sort or another. Sir William Hooker promptly begged permission to annex the Orangery and the land adjacent; then a part of the Pleasure Grounds; and after that the Royal Kitchen and Forcing Grounds. All these petitions being granted, by 1847 the Gardens had reached their present dimensions—about seventy acres. Three years later, the rest of the Pleasure Grounds was granted for the establishment of an Arboretum, making the total area little less than two hundred and fifty acres. "The Arboretum is the richest in Europe, no doubt," says the writer in the *Saturday Review*, "but probably inferior to that of Harvard University, where special attention has been paid to this department." This admission in a British journal, and the *Saturday Review* above all others, should be very gratifying to Americans. The failure of Kew's Arboretum to be the finest in the world is explained on the ground that the soil—sandy and shallow, resting on a stratum of gravel—is unsuited to many kinds of trees. In former times, also, when an imperial collection had to be got together as quickly as possible and as cheaply, specimens were not planted with the care which might have overcome the disadvantage. It became necessary to reconstruct the Arboretum twenty years ago on this account. A singular example of the influence of fashion in gardening then came to light. The British public had been running after evergreens so hotly that nurserymen had ceased to grow deciduous species. It seems incredible that the authorities of Kew should have asked in vain for months throughout England, Scotland, and Ireland for young aspens. As for American oaks, maples, etc., they absolutely could not be found in the kingdom. Unscientific lovers of the beautiful may rejoice that it has not yet been found necessary to interfere with the old forest trees planted, perhaps, by Lord Capel. The newcomers are arranged by genus—all the willows, for example, with the alders, around the pretty lakes, pines here, cedars there, oaks, nuts, maples, tamarisks, camellias, ranunculus, etc.

In the Garden proper the smaller plants are found in bewildering array. No list of the species represented at Kew has been taken since that of the younger Aiton in 1810, but one is now being made. Some departments have been catalogued already. Of orchids there are about 1,400 species; ferns, 1,100; stove plants, 2,500; succulents, 1,000; palms and cycads, 500; greenhouse plants, 3,000; herbaceous, 4,000; trees and shrubs, 3,000. In several cases, however, the figure is but a guess as yet. The total, great as it will prove to be, bears but a small proportion to the sum of Nature's wealth. If we take the flowering plants alone as enumerated in Bentham and Hooker's "Genera Plantarum," there are 200 natural orders, 10,000 genera, and 100,000 species; and this leaves out of account the ferns and all the lower orders of the *Cryptogamia*. The Economic Section has few visitors, and they are not tempted to carry exploration far. Not a few of the culinary and medicinal herbs in use are found here. If by some fatal chance the onion of commerce should be exterminated in the back gardens of England, Kew is prepared to replace it. Side by side therewith grow the patience-dock and the skunk-cabbage, the briony, the cuckoo-pint, the Japanese yam, and the all-good. In ferns the Kew collection is exceedingly rich. It has had three special benefactors in this department, to the first of whom, Mr. George C. Joad, the public is indebted for the charming rock garden opened in 1881. Sir Joseph Hooker had long been working for one, and the bequest of Mr. Joad's collection of ferns brought the matter to a crisis. Dr. Cooper Forster was an enthusiast upon the culture of filmy ferns, and Mr. W. C. Carbonell was specially interested in the cultivation of hardy ferns, particularly in the crossing of them and the development of sports. Both these gentlemen bequeathed their treasures for the nation's enjoyment when their own power of enjoying them ended.

The glass houses at Kew are extensive structures. The Winter Garden covers more than an acre and a half of ground. The Palm House is 362 feet long and 100 feet wide. The new Orchid House is 140 feet in length, adding the two wings together. This last is not wholly satisfactory—to the orchid enthusiast an orchid house never is nor can be. Supplemented, however, by a low, neat range, from which the public is excluded, nearly all the 1,400 which form the national collection thrive admirably. British orchidists are proud of Kew nowadays, for it was not so satisfactory in this department a few years since.—FREDERICK A. FERNALD in the *Popular Science Monthly* for May, 1890.



A FEW HINTS ON GLASS-BLOWING.

WHILE an ordinary alcohol lamp or Bunsen burner will answer as a source of heat for bending or moulding glass, in cases where small tubing and soft or lead glass are to be treated, it is under all circumstances preferable to be provided with a blast lamp, since many pieces of apparatus cannot be properly constructed without this. A blast lamp, preferably for gas, may be either permanently attached to a table by a swivel joint and the blast worked by a treadle; or the lamp may be transportable, and is then best worked by a Fletcher blower, with or without the interposition of reservoir bulbs to maintain a steady pressure. A regular glass-blower's table usually has two blast lamps facing each other, so that a piece of glass held between the blasts may be surrounded on all sides by the flame.

Glass to be worked by the blast lamp is generally used in form of tubing, sometimes in form of rods. The glass to be worked should neither be too hard nor too soft, as it will be difficult to maintain it at the proper plastic degree for being shaped. If it is too hard, it is apt to congeal on one side too rapidly when taken out of the flame, for the real shaping of the glass into some form or other is always done outside of the flame. And if the glass is too soft, it is apt to bend or twist before the operator has acquired control over its formation.

Before working the tubing it should be carefully cleaned inside and outside, so as to remove all dust, grease, and particularly all moisture. It should also be free from blisters, sand grains, or other visible defects at the place where it is to be heated. A cardinal rule in working glass is, not to heat it longer or more intensely than necessary.

If a blast lamp is used, the piece of glass is first heated in the gas flame (without blast), being constantly turned, and the flame applied along some distance on either side of the working place, so as to prevent uneven shaping. When the article to be produced has been completed, it must be annealed by coating it with soot in the smoky flame of the gas jet deprived of air. If this is not done,

especially with thick glass, it is very liable to crack afterwards.

If only a small spot is to be heated—for instance, when a hole is to be blown into tubing—a small pointed flame, such as is produced with an excess of air, is used. When larger surfaces are to be heated, the full yellowish-tinged blast, with less air, is employed.

One of the most simple operations is the turning over and smoothing of the edge of tubes—for instance, that of test tubes. Here it is only necessary to maintain a uniform high temperature. For "turning over," a conical piece of wood charcoal or gas carbon, or a triangular piece of tinned iron, is used, against which the rim of the tubing is revolved in the flame. Gas carbon has the advantage over wood charcoal that it is much less liable to adhere to the glass, and that it does not ignite when brought in contact with the flame. If the rim is to be entirely laid over, it is pressed, while soft, against a polished plate of carbon. If too strong a heat is applied, so that the glass shows signs of forming drops, the rim will collapse and the work is lost.

Narrow glass tubing is better bent in simple Bunsen burners than in the blast flame. A very good burner is that which delivers a flame from a long, horizontal slit. Whatever flame is used, the actual bending of the tube must not be done in the flame, but the tube, after it has been properly heated, must be withdrawn first. The heating and bending must be done over a small extent of surface at a time, and only to a moderate degree. The wider the glass tubing is, the more care must be used by the operator. When a workman finds that he cannot bend a piece of wide tubing without causing it to be misshapen, he sometimes fills the tubing with dry sand, which, to a certain extent, maintains the round bore of the tube. If a tube has collapsed, it may often be restored by softening the collapsed part in the flame and blowing in the tube, the other end being plugged. Since the convex side of tubing, during the formation of the bend, is more stretched than the other, it must be more thoroughly heated.

A tube may easily be diminished in calibre, or drawn out to a point, by heating it uniformly over a smaller or greater surface—according as a short or long drawn point is wanted—and then gently drawing it in opposite directions. Drawing out glass, of course, diminishes its thickness. If glass is to be drawn out without making it weaker, the place to be drawn out is first reinforced by gathering upon it an extra quantity of glass by heating and pushing it together so as to increase the thickness at that particular place. This "gathering" of glass must be done cautiously and slowly, otherwise it will not be uniform, but wavy.

To form a tube closed at one end, it is first drawn out to a short point; the point is then closed by fusion, the adhering droplet of glass removed by a piece of glass rod, and the bottom smoothed by first heating, then removing from the flame and blowing into the tube held upward. If the bottom is still misshapen, it is heated again and once more blown out.

If a tube is too short to be taken hold of at both ends, one of its ends is softened in the flame, a piece of tubing or rod fused on to it, and the point thus formed.

If the bottom is required to be flat, it is first blown out as just described, then heated again in the flame and pressed upon a freshly cut, flat piece of charcoal, from which it is immediately returned to the flame and annealed by coating it with soot. If such flat bottoms are not carefully annealed, they are very apt to crack and drop off.

Indentations, either in the bottom or in the sides of glass tubes, may be produced in a similar manner by softening in the flame and forming the depressions by means of a piece of charcoal or gas carbon.

In holding a glass tube over a flame for the purpose of bending it, it should be grasped so that all weight is taken off the place to be heated. When tubing is very long, so that the outstretched arms are unable to grasp it at the proper place, one end of it is laid in the loop of a piece of rope or string hanging from the ceiling, or may be held by an assistant who is trained to follow the motions of the operator.

Heliotrope Perfume.—E. Campe's formula in the *Chemiker und Drogist* for a perfume for retail sale is:

Oil of Bergamot	1½ oz.
Vanillin	8 grains.
Tinct. Benzoin	2 drachms.
Rectified Spirit	60 oz.

Cochineal.—The cultivation of cochineal on the Island of Teneriffe was commenced about sixty years ago, and in 1831 the first exports (about 19 pounds) were made. The shipments rapidly increased until 1869, when the maximum quantity of 1,888,708 pounds was exported. Since that time the cochineal trade has been on the decline, owing to the introduction and diffusion of the coal-tar dyes; and the culture of the vine is again attracting more attention.

Notes on Essential Oils from Messrs. Schimmel & Co.'s Report.

THE following notes on various essential oils and allied substances are taken from the April *Bericht* of Messrs. Schimmel, of Leipzig:

Distillation in Vacuo.—In some introductory remarks Messrs. Schimmel report that they have succeeded in attaining a practical solution of the problem of distilling essential oils on a large scale in a vacuum. It is stated that the first large apparatus of the kind erected in their establishment has been at work for some weeks, and that the results leave no doubt that the influence upon the distillation of essential oils will be great, since the injurious action of heat upon the easily decomposable oils is avoided in proportion to the diminished atmospheric pressure under which they are distilled.

Anise Oil and Anethol.—As characters for determining the value of anethol the specific gravity of the pure compound at 25° C. is given as 0.986 and the melting point as 21° to 22° C., the latter being taken by simply inserting a thermometer into a flask with melting anethol. Ordinary anise oil is said to melt at 15° C., and the inferior qualities of anethol obtained by fractional distillation, between 15° and 21° C., according to the degree of purity. By repeated contact with air a small portion of anethol is oxidized, probably to anise aldehyde, the change involving an increase in specific gravity and a lowering of the melting point. A sample of anethol that had been remelted frequently and come into contact with air had a melting point of 19° to 20 and a spec. grav. of 0.990 at 25° C.

Arnica-Root Oil.—The stock of arnica-root oil having become exhausted, and no German roots being available, an experiment was made in distilling Italian roots, but these proved utterly worthless.

Betel Oil.—Referring to Eykman's latest communication upon betel-leaf oil, the opinion is expressed that the differences observed by that chemist in the constituents of the oil distilled by himself and that distilled by Schimmel & Co. cannot be attributed exclusively to the fact that the former was distilled from fresh leaves and the latter from dry, but are more probably referable to differences as to soil and climate in the conditions under which the plants they were derived from were grown. According to Eykman not only the two oils, but the phenols separated from them, differed in odor, the phenol from the oil distilled by Schimmel & Co. from dry leaves not even recalling the smell of betel leaves. But in comparing the phenols from a specimen of oil distilled from fresh leaves, placed at their disposal by Dr. de Vrij, Messrs. Schimmel failed to distinguish the slightest difference in odor from that of their own betel phenol, notwithstanding that the mixture from this oil of fresh leaves evidently contained a second phenol. Further experiments are deferred until the receipt from India of a supply of oil distilled from fresh betel leaves.

Carrot Oil.—The oil obtained in the distillation of the dried fruit of *Daucus Carota* has been examined by Dr. Landsberg, who finds it to consist essentially of two constituents: (1) a terpene boiling between 159° and 161°, belonging to Wallach's groups of pinens; (2) an oxygenated body, of the composition of $C_{10}H_{18}O$, standing in near relation to cineol, and that may be considered as terpene monohydrate. No practical use for this oil has yet been found.

Cascarilla Oil.—There has been a remarkable demand for this oil within the last six months, but it is not known for what purpose it has been required.

Cassia Oil.—As a consequence of the exposure in a former report of the adulteration in China of cassia oil with resin, it is stated that this practice was at once abandoned. Some subsequent shipments, however, although of normal specific gravity, thin and beautifully clear, and free from adulteration with resin, petroleum, or fatty oil, were deficient in sweetness, and left on the tongue an unpleasant bitter taste. Upon determining the proportion of cinnamic aldehyde, this was found to be low, varying between 49.4 and 69.8 per cent. Further remonstrance was therefore made, with the result that a later consignment contained from 70.9 to 77.7 per cent of cinnamic aldehyde, a quantity more nearly corresponding to that found in some old samples of the oil, as recorded in a previous report. Incidentally to the discussion, Messrs. Schimmel received the information that the Chinese now export two qualities of cassia oil, one distilled from the leaves and the other from the root of the cassia shrub, but it is not known at present which kind contains the larger proportion of cinnamic aldehyde. It is still considered that cinnamic aldehyde is the most important constituent of cassia oil, and the following indirect method of estimating it is recommended: 75 Gm. of oil are mixed in a good-sized flask with 300 Gm. of a boiling 30 per cent solution of acid sodium sulphite. Cinnamic aldehyde separates immediately as a coagulum, and the mixture is well shaken and left to stand. When the proportion of aldehyde is large there is considerable development of heat, which must be controlled with cold water. About 200 Gm. of hot water are then added and the whole is

heated, with frequent agitation, in a water-bath until the compound of aldehyde with the bisulphite is completely dissolved and the non-aldehydes form an oily layer on the top. After cooling, the non-aldehydes are removed by shaking first with 200 C.c. and then with 100 C.c. of ether, the ethereal solution is separated, the ether carefully driven off, and the residue weighed. The weight, deducted from that of the oil taken, gives the proportion of cinnamic aldehyde.

Elemi Oil.—This distillate is said to be coming into demand as an addition to soap perfumes.

Eucalyptus Oil.—It is reported that eucalyptus oil is now prepared on a large scale in the south of France. In Gladstone, Queensland, arrangements are said to have been made by a local chemist for the distillation of oil from *Eucalyptus citriodora*, a species that grows plentifully in Port Curtis district, to the extent of working up half a ton of leaves daily. The distillation of an oil from a eucalyptus, having a peppermint-like odor, is also spoken of. This oil, it is thought, would probably be derived from *Eucalyptus Hæmastoma*, since an oil from this species, previously examined, was found to contain, besides terpene and cymol, an oxygenated constituent, possibly identical with menthon.

Fennel Oil.—The knowledge of the composition of fennel oil has hitherto been very superficial, being limited to the fact that it consists principally of anethol. A recent examination of the fractions boiling at low temperatures has shown that, besides acids and aldehydes, dextro-pinen is present in large quantity. The fraction boiling at 160° consists of dipenten. There was also found a substance boiling at 190°–192°, having an intensely bitter, camphoraceous taste, to which, conjointly with pinen and dipenten, the peculiar odor of fennel is due. This body is being further investigated.

Galanga Oil.—Sp. gr. 0.921 at 15° C.; boils between 170° and 275°. The oil contains considerable quantities of cineol, to which the camphor-like odor is due.

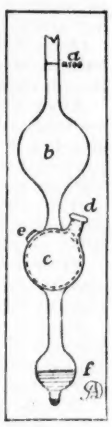
Galbanum Oil is described as pale yellow and of a very pronounced galbanum odor; specific gravity 0.914 at 15°; boils between 165° and 300° C., apparently without decomposition.

Pine Oils.—The consumption of different varieties of pine oil is said to have considerably increased during the recent epidemic. The oil from *Pinus Picea*, as well as the finer sorts of oil from *P. sylvestris*, have also been recently much used in the bonbon industry. It is pointed out that in the manipulation it is necessary before all things to prevent resinification by adding the oil dissolved in a little spirit to the sugar after it has cooled; if this rule be neglected, the bonbons acquire a disagreeable resinous taste. Ol. pini pumilionis has been introduced into the new edition of the Austrian Pharmacopœia, where the characters of it given are "colorless or green-yellow, peculiar aromatic agreeable odor, aromatic bitter and acrid taste; specific gravity, 0.850; boiling point, 170° C." Messrs. Schimmel say that, unfortunately, these statements do not correspond to facts, and give no assistance in judging a genuine oil. According to their experience with pure distillates, the specific gravity is 0.861 to 0.865 at 15° C., while the boiling point is about 160°–250°.

Valerian and Kesso Oil.—The oil distilled from Japanese valerian or "kesso root" is said to have rapidly come into favor (*Pharm. Jour.* [3], xix., 327, 843). From a practical point of view it is considered to be at least equal to the distillate from German roots, and possibly of still more powerful and persistent odor. The remarkable difference in the yield and composition of the essential oils, it is thought, might have its origin in climatic and soil conditions, especially since it has been shown that kesso root is not, as at first supposed, derived from *Patrinia scabiosæfolia* Link., but from a variety of *Valeriana officinalis* L. It is pointed out that in the new edition of the Pharmacopœia Neerlandica the specific gravity of valerian oil is given at 0.930–0.960, and in the Austrian Pharmacopœia at 0.950, and that only the distillate of the European root would meet this requirement. The kesso oil or Japanese valerian oil has a sp. gr. of 0.996 at 15° C.; it is of a green color, possesses a somewhat thickish consistence, and in respect to odor can scarcely be distinguished from ordinary oil of valerian. When distilled over an open fire considerable quantities of aldehydes and the lower fat acids first pass over; then a hydrocarbon boiling at 160°, recognized as lævo-pinen. In the portion boiling between 170° and 180° dipenten was detected, but whether it was originally in the oil, or was first formed under the influence of the acids and other constituents, has not yet been determined. The fraction boiling between 200° and 220° showed the presence of l.-borneol and terpineol. Between 240° and 260° the acetic and valerianic ethers of the l.-borneol passed over. Some of the foregoing bodies were already known with certainty to occur in ordinary valerian oil, whilst the presence of the others was highly probable. One constituent absent, however, from the ordinary oil, but present in the Japanese, is an oil boiling at 300°, heavier than water, and almost odorless. This oil proved to be the acetic ether of an alcohol that has been named "kessyl alcohol," and represented by the formula $C_{14}H_{24}O_2$. It was obtained by saponification with alcoholic potash in large crystals shaped like a coffin lid, melting at 85°, boiling under ordinary atmospheric pressure undecomposed at 300°–302°, and under a pressure of 11 Mm. at 155°–156°, and yielding a lævogyre alcoholic solution. By oxidation with potassium bichromate and sulphuric acid, a body was obtained containing two atoms of hydrogen less than the alcohol, which crystallized in dense needles, melting at 104°–105°, and boiling between 305°–307°; a solution was strongly dextrogyre. Kessyl alcohol is a monacid alcohol; the acetyl compound, which has the formula $C_{14}H_{23}O_2.CH_3CO$, is a thick, oily, colorless liquid, with a lævogyre action on polarized light. In addition, kesso oil contains another constituent boiling at about 260° C.; it is probably a sesquiterpene, but no crystalline hydrochloric compound was obtained from it. Finally, in the highest boiling portion there is a blue oil contained, possibly the same as that which occurs in chamomile oil and other essential oils.—*Pharm. Jour.*

A NEW SPECIFIC-GRAVITY APPARATUS.

A new apparatus for determining specific gravity has been constructed by Aug. Eichhorn.



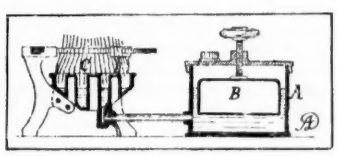
It consists of a glass spindle having a graduated stem (of which only the lowest part is shown in the cut) and three bulbs, one of which (*c*) is intended to be filled with the liquid to be examined, while *b* is empty and *f* contains mercury as ballast.

When the specific gravity of a liquid is to be determined, it is brought to the temperature of 15° C. (59° F.), and the globe *c* of the apparatus then filled with it, so that when the stopper is inserted in *d* there will be no air bubble inside. The apparatus having been thoroughly wiped, if necessary, it is now immersed in water at 15° C., when it will sink to a certain depth. The figure on the stem even with the level of the water represents the specific gravity of the liquid.—*Germ. Pat.* 49,683.

ALCOHOL LAMP WITH ADJUSTABLE BURNER.

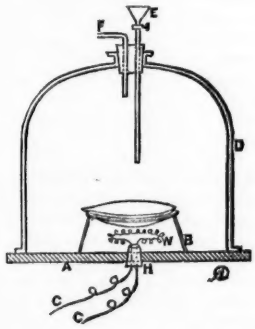
W. Klipphann, of Dresden, Germany, has patented an improved alcohol lamp (Germ. Pat. 48,118) of the following construction:

The lamp consists of a reservoir, A, connected with the burner C. The latter has a conical bottom. The reservoir contains a float adjustable by a screw. When the reservoir has been filled and closed, the level of the alcohol in the burner may be adjusted by raising or depressing the float in the reservoir by means of the screw. In this manner the flame may be made small or large at will.



ELECTRICITY AS A SOURCE OF HEAT IN CHEMICAL WORK.

Mr. R. Fessenden describes some new forms of chemical apparatus (in *Chem. News*) in which electricity is used as the source of heat. We give here a description of his apparatus for rapid evaporation in vacuo.



A is a piece of plate glass, with hole bored in centre, and fitted with a cork, H, carrying two wires which are connected to the ends of the platinum coil, W, packed in magnesia. The dish, with the liquid, is placed on stand B, and covered by a bell jar. F is connected to a filter pump, and the ends of the coil to a primary battery. More liquid is added from time to time through E.

The Manufacture of Phosphorus.

FROM a paper on the present methods of manufacturing phosphorus, by J. B. Readman, and published in the *Journal of the Society of Chemical Industry*, we take the following:

Indescribing the manufacture of phosphorus as at present carried on, I purpose dividing it into several stages under the following heads:

1. The preparation of phosphoric acid from phosphate of lime and sulphuric acid, with description of the apparatus employed.

2. The concentration of the phosphoric acid, together with an account of the mixture of the acid with carbonaceous matter.

3. Phosphorus retorts and furnaces, with description of the distillation and condensation.

1. *The Preparation of Phosphoric Acid, etc.*—This is prepared from one or other of the mineral phosphates of lime, which is ground to a fine powder and then decomposed with chamber sulphuric acid of 1.55 specific gravity. The decomposition is effected in large wooden tuns made of pitch pine or other suitable wood and provided with agitators, also made of wood.

Open steam is blown in during the operation. Sufficient sulphuric acid is added to convert all the lime present in the phosphate of lime into sulphate of lime.

After the expiration of some hours, during which the contents of the tuns are continually agitated, the emulsion is run off to large wooden filters lined with lead and provided with false bottoms, or having ashes in layers of various sizes spread over the floor of the filters.

Here the hydrated sulphate of lime is separated from the solution of phosphoric acid, which passes through the filter as a bright and clear sherry-colored fluid.

At first the phosphoric acid runs from the filters at a specific gravity of 1.17, but gradually it gets reduced by careful washing to 1.01 specific gravity.

Special precautions are observed to avoid cracks on the surface of the gypsum contained in the filters, the formation of which would form too ready an outlet for the washing water.

Whenever the effluent from the filters reaches the specific gravity 1.01 the washing is stopped, and the hydrated sulphate of lime is piled up in the centre of the filters to drain, and finally it is thrown out.

This waste product generally contains about 62 per cent of water, and when this is expelled by heat, what is known as phosphatic gypsum is obtained.

2. *The Concentration of the Phosphoric Acid, and Apparatus employed.*—The strong phosphoric acid liquor flowing from the gypsum filters is blown by one of the acid-resisting steam elevator "blow jacks" to stock tanks, and from there it is run by gravity to the evaporators, which are circular tanks made of iron or wood lined with thick lead, and heated by means of lead coils and high-pressure steam. Each evaporator is provided with an agitator, which is kept in motion during the evaporation.

Sulphate of lime, which is slightly soluble in the acid liquors, is deposited as the evaporation advances, and so great does this deposit become that filtration or decantation is necessary before the acid attains the degree of concentration required. If no agitation is employed during the concentration, the gypsum firmly attaches itself to the coils, forming around them a thick coating which must be removed by chipping. The precipitated gypsum is thrown on a filter and washed in the manner previously described. When the clear acid liquor becomes concentrated to specific gravity 1.4 or 1.5, the evaporation is stopped and any deposited gypsum again separated.

The strong solution of phosphoric acid should now contain a mere trace of lime. Any iron, alumina, or magnesia present in the original phosphate of lime is dissolved to a considerable extent by the sulphuric acid treatment and appears in the acid liquor.

The strong syrupy acid is now mixed with carbonaceous matter, such as wood charcoal or coke, in coarse powder, to the extent of about 25 per cent. It is then carefully desiccated either in iron pots or in a muffle furnace, so as to expel the moisture, sulphurous acid, and hydrocarbons, and afterwards it is carefully stored away in air-tight iron boxes ready to be used in distillation.

3. *Phosphorus Retorts and Furnaces, with Description of the Distillation and Condensation.*—The distillation is carried on in small bottle-shaped retorts, made of the best weathered and prepared Stourbridge fire clay. These retorts or pipes are about 3 feet long by 11 inches in external diameter, the clay being about 1 inch thick. The retorts are placed in a furnace something like a Belgian zinc furnace in construction, but having only two tiers of retorts, each row being placed back to back with their narrow mouths projecting an inch or so through the brickwork.

There are twenty-eight retorts in one furnace; that is to say—taking one side of the furnace and considering it for a moment—there are in the first tier seven retorts, and directly above these there are seven others, making fourteen retorts, which, as explained, project slightly through the side of the furnace. The other side of the furnace is similarly equipped.

The mouths of the retorts are connected to the condensers by two-inch malleable iron or copper pipes, which are luted with clay joints both to the retort and the condenser. Hot water is used in the condensing trough, so that whenever the phosphorus is condensed it fuses and runs down by gravity to the lower end, and may then be lifted out conveniently by a ladle. Each retort holds between twenty and thirty pounds of phosphorus mixture, and yields up the phosphorus which exists in the free uncombined phosphoric acid in about fifteen hours.

When distillation is completed, the two-inch pipes are disconnected from the retorts, the residue is rapidly withdrawn, and the bench of retorts again recharged, the heat being steadily maintained. Should a retort be cracked or fused either at the distillation or charging, any phosphorus mixture it may contain is withdrawn, the dampers are closed, and the retort removed from the furnace. A new retort, heated in an adjoining kiln to the required temperature, is substituted, and all proceeds as before.

The crude phosphorus thus obtained is dark mahogany brown in color. It contains a good deal of impurity.

4. *Refining and Packing.*—The crude phosphorus is fused under water in a lead-lined circular tank heated by lead coils for high-pressure steam, or steam-jacketed. As much water as can be safely decanted off the surface of the crude phosphorus is removed, and about 4 per cent of bichromate of potassium (or the weight of the crude phosphorus) is added in solution. An agitator with which the vessel is provided is set in motion and is continued in motion during refining. After stirring for half an hour with the solution of bichromate, about the same weight of oil of vitriol is added; in this way chromic acid is formed, which oxidizes the lower oxides of phosphorus and leaves the element pure and nearly colorless. Another method of refining, and one more suitable under certain conditions, is to redistil the crude phosphorus in an iron retort. The phosphorus distils over rapidly and at a comparatively low temperature. A combination of these two methods is in some way desirable.

The refined phosphorus is next moulded into "wedges" or "sticks." The wedges are made by melting the phosphorus and transferring it to circular tin dishes 10 inches in diameter by 4 inches deep, and when filled a star-shaped mould is introduced into each, which divides the circle into 10 wedge-shaped pieces, suitable for packing into tin cases.

After this cold water is introduced, which soon solidifies the phosphorus and admits of its easy removal.

Pitjecor.

THIS is the name bestowed by Casati (*Raccoglitore Medico*) upon an absolutely pure cod-liver oil, deprived of fat and non-emulsionized, mixed with a certain proportion of creosote, which latter dissolves easily in all oils and is not modified by them. One tablespoonful of the new preparation corresponds to two of ordinary cod-liver oil. It has the property, according to Casati, of destroying the bacillus of tubercle, rapidly diminishing the tuberculous secretion, suppressing the hectic fever and night sweats, and rapidly ameliorating the general condition. Its effects upon nutrition, says Casati, are most striking, the patient gaining in weight almost from the commencement of its use. The "*huile de foie de morue creosotée*," or creosoted cod-liver oil, prepared by Rigand & Chopoteaut, of Paris, seems to be about the same thing as the "pitjecor" of Casati, and some remarkable instances of its value in phthisis have recently been recorded in French medical journals.

Note on Sulphonal.

THE results of an exhaustive physiological and clinical study of sulphonal are communicated by Dr. John Gordon, of Aberdeen, to the *British Medical Journal*. In its effects upon muscle substance, it would appear from this that sulphonal has a close resemblance to paraldehyde and urethane. The clinical experiments show that small doses (5 to 10 grains) have the effect of increasing the excretion of urea, while doses of 30 to 40 grains decrease the excretion. The hypnotic has a tendency to decrease the excretion of phosphates. It has practically no effect upon digestion. The most important part of the paper is that in which the author shows that small doses are useless for producing sleep; at least 30 grains must be given, and sometimes 60 to 80 grains are required. Generally there are no unpleasant after-effects, but occasionally the drug appears to give rise to certain cerebral symptoms, notably giddiness, and distinct feelings of depression.—*Chem. and Druggist.*

Terpin Hydrate in Whooping Cough.—Dr. Manasse recommends in the *Therapeutische Monatshefte* the use of terpin hydrate as a remedy for whooping cough. He used it with success in forty-one cases, giving it to young children even under a year old, in daily doses of 22 grains; the average dose in powder form was 7 to 15 grains three times a day. He claims to have observed, after four or five days of the treatment, a distinct decrease in the number and intensity of the attacks.

THE INDUSTRIAL PREPARATION OF NITROGLYCERIN.

THE manufacture of nitroglycerin dates back about twenty years, but a description of the process employed is not commonly met with, most descriptions relating only to its preparation in the laboratory and on a small scale.

FIG. 1.—The preparation of nitroglycerin in the laboratory.

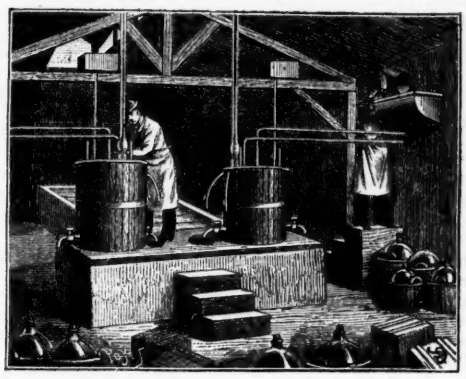


FIG. 2.—Preparatory laboratory of nitroglycerin at Cengio (Italy).

Nitroglycerin is produced by the action of nitric acid on glycerin—a reaction which may be represented by the following formula:

$$\underset{\text{glycerin.}}{C_3H_5(HO)_3} + 3\underset{\text{nitric acid.}}{HNO_3} = \underset{\text{nitroglycerin.}}{C_3H_5(NO_2)_3O_3} + 3\underset{\text{water.}}{H_2O}$$

Besides the nitroglycerin obtained by replacing the three molecules of hydroxyl of the glycerin by three molecules of nitric peroxide, there is, as may be seen, a formation of water, which is absorbed by the addition of sulphuric acid.

In the manufacture of nitroglycerin the apparatus used is capable of producing about 100 Kgm. of the substance every half-hour. Fig. 2 shows the interior of the laboratory; Fig. 3, the appearance of the apparatus; Fig. 4, a bird's-eye view of the works at Cengio, in Italy.

Before passing these works in review, let us study the preparation of *one* kilogramme of nitroglycerin.

Prepare separately in a glass cylinder (Fig. 1) 1.5 Kgm. of nitric acid at 48°, and 3 Kgm. of sulphuric acid at 66°; allow this to cool, after having sufficiently stirred it with a glass rod; then place the cylinder in another receptacle, filled with cold water, and *drop* into the mixture 500 drops of glycerin marking 30°, stirring all the time.

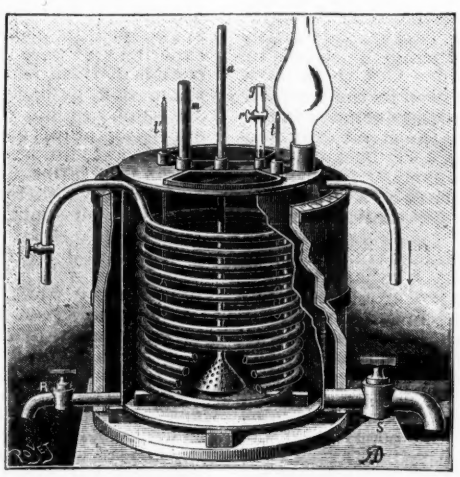


FIG. 3.—Industrial apparatus used in the manufacture of nitroglycerin.

The reaction is accomplished when the glycerin is introduced, and the nitroglycerin settles at the bottom of the cylinder in a whitish, opaque mass of flaky aspect.

Rid the mixture of the excess of acid, wash thoroughly with water, and finally with a solution of carbonate of sodium until test paper shows no acidity.

Thus the nitroglycerin has passed through the successive phases of industrial manufacture — *preparation* of the acids; *reaction* of the glycerin on the mixture, resulting in the formation of the nitroglycerin; *separation* of the acids; *washing* the nitroglycerin with running water, and finally with carbonate of sodium to complete its *neutralization*.*

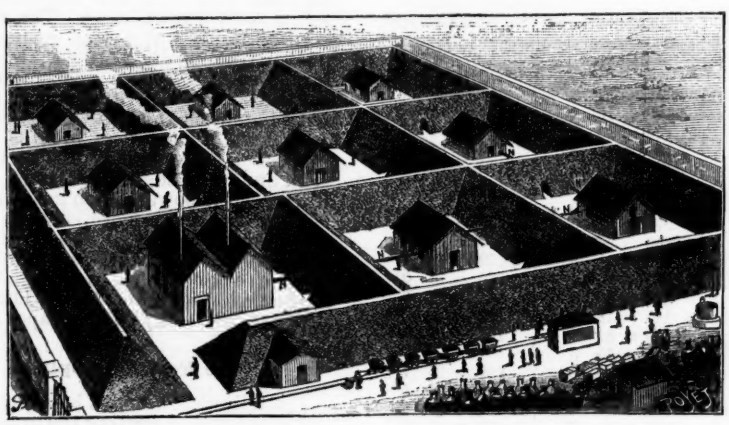


FIG. 4—Bird's-eye view of the laboratories at Cengio.

Let us now consider our industrial manufactory, which will be easily understood if the reader will bear in mind the principal points of the proceedings already mentioned. The process is the same as that in use for the last few years at Cengio, Italy.

Though there are more elaborate machines than the one we are about to describe, there are none that are more remunerative, as the average yield in the most extensive works is never more than 200 parts of nitroglycerin for 100 parts of glycerin submitted to the reaction —proportions obtained at the works we have taken for a model. The two principal machines connected with the manufacture of nitroglycerin are, first, the pump supplying running water for the different manipulations; and, second, the machine for the compression of air, which furnishes the air necessary for the stirring and mixing of the ingredients.

As the point of congelation varies with the external temperature, from 8° to 9°, sometimes even 10°, above zero, the least change in the atmosphere makes it necessary to heat the workroom by means of steam pipes, which are supplied by a boiler placed in an out-building distinct from the sheds where the dynamite is made (Fig. 4). The sheds are sunk in bastions of earth which surround and protect them. In the first and most important building we see the process of the reaction of the glycerin on the nitric and sulphuric acids, already explained. Three or four apparatuses, similar to the one represented in Fig. 3, are ready to act; each one destined to furnish 100 Kgm. of nitroglycerin every half-hour, that being the time allowed for reaction.†

The apparatus consists of a cylinder made of staves and strongly bound with hoops, the whole being encased in lead, which resists the action of the acids. The dimensions of the cylinder are as follows: 0.95 M. high by 0.85 M. in diameter, making the capacity about 500 liters. Into this cylinder is emptied the given proportion of the acid mixture—usually about 300 Kgm. of sulphuric acid to 150 Kgm. nitric acid. These two acids once mixed, the glycerin (about 50 Kgm.) is poured in *very* slowly. By the time all the glycerin has been introduced the reaction is accomplished; the latter is hastened by a jet of compressed air, and the whole is cooled by two concentric streams of running water.

In half an hour, with the above proportions, the operation is finished and the nitroglycerin has only to be separated from the excess of acid with which it is mixed, then washed and neutralized.

To understand the different manipulations which are to transform the impure nitroglycerin still mixed with

* These operations are without danger, but might become dangerous to one not familiar with explosive bodies.

†With two apparatuses, allowing for emptying and cleaning, 700 to 800 Kgm. of nitroglycerin can be manufactured in four hours, that being the amount required for the daily manufacture of 1,000 Kgm. of dynamite.

acids, all that is necessary is to consult Fig. 4. The impure nitroglycerin must first be separated from the excess of acids, then thoroughly washed, and finally neutralized by being treated with carbonate of sodium solution.

From the preparatory house the nitroglycerin, still impure and mixed with acids, goes to another, in which, by a simple difference in density, the nitroglycerin is separated from the acids. From a large lead cylinder, which is about 1 M. high and 0.70 M. in diameter, it passes through tubes to another room, being forced through these tubes by a flow of water, cold in summer, hot in winter. Once there, it falls into wooden vats filled with water, where its separation from the acids is hastened by a jet of compressed air.

On coming out of these vats it passes into others, where, by means of compressed air, it is stirred in a mixture of carbonate of sodium.

After this the *pure* nitroglycerin, now neutral to litmus, is taken to another house to be transformed into dynamite. Here it is put into zinc cylinders filled with water, after which it is filtered through felt tubes to remove from it the traces of water it may have received.

If any of our readers, to finish his education on the subject, wishes to visit any of the works where nitroglycerin is manufactured, either here or abroad, let him heed a word of advice: If you go, touch nothing; do not even *look* too long, or you may bring home with you severe neuralgic pains, due to the rapid action of the vapors arising from the nitroglycerin on an organization not accustomed to it. This intoxication is a thing for which as yet no remedy has been found, and it is one of the most annoying and curious phenomena connected with the manufacture of nitroglycerin.—After *La Nature*.

The Opium Crop in Turkey.

THE following statistics give the production of opium in the whole of the Turkish Empire in Asia and Europe during the last twenty-six years, together with the highest and the lowest prices of opium (in Turkish and British currency) on the Smyrna market during the season in question. The figures show that, since 1864, there have been 128,400 baskets of opium produced in the Turkish Empire, the Persian production not being included in the returns. Deducting from this total the stock of opium now believed to be in existence—viz., 4,800 baskets (1,400 baskets in Smyrna, 700 in Constantinople, 1,700 in London, and 1,000 in America, etc.)—we have an average consumption, during the last twenty-six years, of about 4,750 baskets of opium.

The comparatively large crops obtained since 1868 are explained by the fact that until that season the cultivation of the poppy was restricted to four or five provinces in Anatolia (Konieh, Karahissar, Sourahan, Bogaditch, and the neighborhood of Smyrna), but after 1869, when the failure of the crop had caused an immense advance in the price of the drug, the cultivation was extended to other parts of the empire, over the whole of northern Anatolia, and in Roumelia. Since that period the peasants became accustomed to the cultivation of the poppy, and the prices thenceforth became dependent upon the greater or smaller yield of the crop. It is said that the future of the opium industry in Turkey is becoming more uncertain. The extension of the railway system especially operates against the continuation of opium cultivation, because it encourages the growing of cereals, which require less attention, are less easily destroyed by inclement weather, and for which the demand is not so much influenced by speculation.

Year.	Yield of Crop.	The Smyrna Prices during the Season.	
		Highest.	Lowest.
	Baskets.	Piast. s. d.	Piast. s. d.
1864	3,400	140 = 16 6	111 = 13 0
1865	4,350	130 = 15 2	94 = 11 0
1866	1,350	160 = 18 8	122 = 14 0
1867	3,000	170 = 19 10	120 = 14 0
1868	1,600	390 = 45 6	146 = 17 0
1869	3,500	295 = 34 5	180 = 21 0
1870	4,300	270 = 31 6	130 = 15 0
1871	8,500	200 = 23 4	130 = 15 0
1872	4,460	220 = 25 8	170 = 19 1
1873	3,150	260 = 30 4	165 = 19 0
1874	2,430	274 = 32 0	130 = 15 0
1875	6,300	145 = 16 11	122 = 14 0
1876	3,250	190 = 21 6	137 = 15 0
1877	9,450	138 = 15 8	122 = 13 10
1878	6,050	145 = 16 5	120 = 13 7
1879	4,300	250 = 28 4	135 = 15 3
1880	2,100	250 = 28 4	135 = 15 3
1881	11,000	135 = 15 3	103 = 11 8
1882	4,500	135 = 15 3	90 = 10 2
1883	6,970	115 = 12 10	85 = 9 6
1884	5,400	115 = 12 10	90 = 10 0
1885	7,400	95 = 10 7	80 = 8 11
1886	7,600	164 = 18 0	63 = 6 11
1887	1,800	180 = 19 10	71 = 7 10
1888	7,300	100 = 11 0	62 = 6 10
1889	5,000	— = —	— = —

—*Chem. and Drugg.*

The Oils of Betel Leaves.

THE *Piper Betle* L. (*Chavica Betle* Miq.) is a creeper extensively grown in India and the Malay Peninsula, being very commonly trained on the trunk and branches of the *Æschynomene grandiflora*, a quickly growing tree, in the neighborhood of villages and in plantations. The leaf, well known as betel leaf, has long been in universal use in these countries as a masticating stimulant and aromatic. The preparation known as "pàn supari" (*pàn*, betel leaf, and *supari*, areca or betel nut) consists of a betel leaf made into a triangular packet, enclosing fragments of areca nut and catechu, with a smearing of wet lime. Cardamoms, nutmegs, cloves, camphor, and other aromatics are a common addition. Thus prepared it is an article of constant use for chewing among all classes. There is often a sense of languor when deprived of it; it is a staple amenity in social life, and on occasions of ceremony it is served gorgeously done up in gold leaf. When chewed it colors the saliva red, and, while it does not improve the appearance of the mouth, it is an undoubted antiseptic and stimulant, and is said also to improve the voice.*

As an article of commerce, betel leaf is always green and fresh, and in transporting or storing it great care is taken, by frequent airing and wetting, to maintain its fresh appearance. For sale, the leaves are sorted one by one, the damaged rejected, and the others, tied in small bundles, are priced according to size and quality.

The composition of betel leaf has not, to my knowledge, been thoroughly investigated. In 1885 I obtained from it by distillation two volatile oils, a heavy and a light, and it is in connection with these products, round which considerable interest is gathering, that I write these notes.

Professor Eykman, and Messrs. Bertram and Gildemeister of the firm of Schimmel & Co., have both obtained volatile oils, the former from fresh, the latter from dried leaves, but in neither case was the product obtained in two separate portions of different specific gravity. My experiments were performed in June, 1885, when 152 pounds of fresh leaves of mixed quality, as obtained in the market, by being distilled in several portions, using the same original water throughout, yielded me 3 fluid-ounces of oil of specific gravity (*without corrections*) 1.039, and 2½ fluidrachms of a light oil, the former sinking and the latter floating on the water of the receiver.

Referring to a failure by Mr. Preble to obtain more than one oil—and that the light one—by distilling 90 pounds of fresh leaves, Mr. Kemp said that it would appear that in January, in the middle of the dry and cold season, the yield of oil is small and consists only of the light variety, while in June, in the hottest weather and at the commencement of the rains, the yield is large and mainly consists of heavy oil.

Eykman reported in November last, in the *Berichte*, the results of distilling a large quantity of Javanese leaves. The result was a proportionately very small quantity of volatile oil, clear, pale, greenish-yellow color, becoming golden-brown by exposure to air; with the aroma of the leaf, a burning but agreeable taste, recalling mint or lemon, but somewhat like creosote. It was lævo-rotatory (− 3.5 for 200 Mm. by sodium light); s. g., 0.959 at 27° C. Shaken with KHO solution, about one-third was dissolved, with gradual assumption of brown color, and from this solution diluted sulphuric acid precipitated a brown phenol. For purification this phenol was redissolved in KHO solution, shaken with ether (removing a small amount of oil of a pronounced mint taste), reprecipitated with acid, and dissolved in ether, which now left a little brown resin. The ethereal solution, after washing with water, was evaporated, and the residual phenol fractionally distilled. Finally, the product distilling at about 237° C. was considered a pure phenol, and to this substance, constituting the main bulk of the phenolic liquid, Eykman gave the name of *chavicol*.

Chavicol is a colorless liquid of a creosotic odor, soluble in alcohol, ether, chloroform, petroleum ether, KHO solution, and very slightly in water or ammonia. Trials of its antiseptic powers upon gelatin cultures showed that it is about five times more efficient than phenol, and twice the strength of eugenol as a bacteria poison.

For further particulars regarding the constituents of betel leaves, consult a paper by D. S. Kemp in the *Pharmaceutical Journal* of March 15th (from which the above is extracted), or Eykman's paper above referred to.

The Future Supply of India-Rubber.

THE following account is taken from *Industries* (8, 187): The work of collecting the crude rubber juice in Brazil has been left till recently to ignorant natives, who have destroyed millions of trees either by cutting them down or by their injudicious system of tapping. Latterly, however, the province of Amazonas has passed laws to regulate the season for tapping trees, and awarded premiums to encourage the planting of new forests.

Some twenty years ago the importance of the question of

* On Betel and betel-chewing compare also: Dr. L. Lewin, "Ueber Areca Catechu, Chavica Betle, und das Betelkauen." 8vo, Berlin, 1889.

the future supply of rubber was recognized by the British government, and James Collins, of Edinburgh, was instructed by the India Office to draw up a report concerning the rubber trees of America, and to ascertain whether they could be grown in India. The results of his investigations were published in 1872. In 1875 Robert Cross, of Liverpool, in concert with C. R. Markham, of Assam, went to Panama to collect seeds and cuttings of the Central American rubber tree (*Castilloa*). He was also sent by the India Office in the following year to Pará to collect information about the Pará (*Hevea*) and Ceara (*Manihot*) trees, which produce the best rubber. The descriptions given in his official report show that he met with formidable difficulties in the course of his undertakings, but he succeeded in his main object. The seeds and cuttings which he obtained were duly sown and planted at Kew, and in due time dispersed over various botanical gardens in India and the colonies. As trees, they are now flourishing at Madras, Calcutta, and Zanzibar, also in Burmah and Ceylon. The great superiority of the Pará rubber (*Hevea*) over all other kinds has insured for it the most attention; but its cultivation has been very much of a failure, notably in Assam and northern India, though not equally so in Burmah and Ceylon. It requires an equable, moist climate without extremes of temperature. The Castilloa tree was reported a few years ago to be doing well in Burliar and other places in southern India. Some attempts have been made to grow the West African tree (*Landolphia*) in India. It is a hardy shrub, but takes up a good deal of room, and the quality of its products leads to some doubt whether it would pay for cultivation. The following is a short list of plants producing india-rubber:

Nat. Order.	Genus.	Species.	Locality.
Euphorbiaceæ..	Hevea.....	H. Braziliensis.	Pará.
	Manihot.....	M. Glaziovii...	Ceara.
Artocarpaceæ...	Castilloa.....	C. elastica.....	Central America.
			West Indies.
	Ficus.....	F. elastica.....	Assam, Rangoon.
			Java.
Apocynaceæ....	Hancornia...	H. speciosa....	Pernambuco.
	Urceola.....	U. elastica.....	Borneo.
	Vahea.	V. gummifera.	Madagascar.
	Landolphia..	Various.....	West Africa.
			Mozambique.

The above trees are to be met with in a broad zone parallel to the equator where there is an isotherm of 70° F.

Turning from the consideration of trees as they grow in untended nature to those that have been acclimatized, a report in 1881 by Dr. King, of the Calcutta Botanical Gardens, stated that the Ceara tree was the only one that promised good results, while the Pará and the Madagascar had utterly failed. This experience has been confirmed by Sir John Kirk, consul at Zanzibar, who, in one of his official reports in 1882, said that the Ceara (*Manihot*) plants grew very well even in the worst soil, needed no attention, and commenced to yield rubber in five years, though not in a way to be remunerative. In October, 1882, Dr. Trimen, of the Ceylon Botanical Gardens at Peradenya, sent to Kew a sample of the Central American rubber (*Castilloa*) produced from a cutting sent from Kew in 1876. This was examined by an expert, and reported to be of good quality, only deficient in tensile strength, owing perhaps to the immaturity of the tree from which it was taken. Colonial rubber is being received at Kew and submitted for examination, showing that this branch of economic botany is far from being neglected. Of Pará rubber from a Kew cutting grown at Mergui, the first sample was received last season at Kew. As in the above case, it was found wanting in tensile strength, and fell short of the best qualities of ordinary smoked Pará. It remains to be seen whether the excess of its viscous over its fibrous constituents will be corrected in future tappings. It is not only in acclimatizing foreign trees in India that work has been done, but, acting on Collins' report, the India Office has caused denuded districts to be replanted with the indigenous *Ficus elastica*. Already in 1870 there was a plantation of these trees at Chardnar, in the district of Darrang, which covered a space of eighty square miles. This particular area has since been annually increased, and there has been planting in other districts besides.

Resin Soap as an Emulsifying Agent.

MR. H. COLLIER (*Pharm. Journ.*, March 15th) describes the emulsifying properties of a compound formed by boiling yellow resin with a solution of sodium hydrate, which he thinks will prove valuable. A similar compound is present in all common yellow soap. This resin soap he prepared by boiling gently for two hours, in an evaporating dish, 1,800 grains of resin with 300 grains of caustic soda, dissolved in 1 pint of distilled water. Upon cooling, the soap separates as a yellow, pasty mass, which is drained, well squeezed, heated to dryness on a water-bath, and powdered in a mortar. Made in this way the soap is somewhat like powdered yellow resin; it is soluble in water and rectified spirit; from concentrated solutions prepared by heat, part of the soap separates on cooling, but gelatinization never occurs. The taste is resinous and somewhat acrid. Five Gm. dissolved in water, the solution acidulated with hydrochloric acid, and the liberated resin acids separated by ether, after drying, weigh 4.22 Gm., corresponding to 84.4 per cent of resin.

Mercury shaken in a bottle with a solution of resin soap is immediately broken into very minute globules; as long as this divided mercury is kept moist with the solution, it will not run together. Each globule is coated with a layer of soap, which completely prevents it from coalescing with its neighbor. Chloroform shaken up in the same manner is converted into a permanent cream-like liquid. Ordinary soap and tincture of quillaja act in a similar manner upon mercury and chloroform; in fact, this experiment is a proof of the fact that these substances possess the essential property of an emulsifying agent. Resin soap, compared with sapo durus and sapo mollis B. P., has a more powerful emulsifying effect upon oils, etc., and it possesses also the great advantage of not becoming gelatinous. Compared with tincture of quillaja it appears to give greater viscosity to liquids, so that suspension of the emulsified oil, etc., is more perfect.

A solution of coal tar may be prepared on the lines of the B. P. C. formula for Liq. picis comp.:

Resin Soap	2 ʒ
Rectified Spirit	1 pint.

Dissolve the soap in the spirit by means of a gentle heat, and then add—

Prepared Coal Tar	4 ʒ

Digest at a temperature of 120° F. for two days, allow to become cold, and decant or filter. This solution poured into water forms a perfect emulsion, which does not separate either upon dilution or standing. In the same way can be prepared emulsion-forming solutions of tar, oil of cade, and balsam of Peru. The fixed oils—cod-liver, almond, olive, and castor—have been emulsified according to the following formula:

Oil	1 fl. ʒ
Resin Soap	10 grains
Water	1 fl. ʒ

Dissolve the soap in the water, and shake with the oil. The oil is perfectly emulsified, and there is no separation into layers, even after long standing. It is possible to make an excellent emulsion with only 5 grains of soap, but a separation into a cream and a milky liquid occurs in time. Oleum terebinthinæ, Oleum pini sylvestris, Oleum pini pumilionis, and pure terebene, when emulsified, are miscible with water in any proportion without separation. This emulsive form will, I think, be found very useful for the preparation of inhalations of volatile oils. These emulsions have been prepared according to the following formula, which is of the same strength as Vapor olei pini sylvest. B. P., resin soap taking the place of the magnesium carbonate:

Volatile Oil	3 ij.
Resin Soap	10 grains.
Water	sufficient to produce 3 fl. ʒ

Dissolve the soap in the water, and shake with the oil. Creosote requires double the amount of soap for perfect emulsification compared with the above volatile oils.

Spirit of camphor containing 5 grains of resin soap in each fluidrachm can be mixed with water, and the camphor remains perfectly suspended. Tincture of tolu with the same quantity of soap is also miscible with water in the same manner. Thymol prepared as follows does not separate on the addition of water:

Thymol	18 grains.
Rectified Spirit	3 fl. ʒ.
Resin Soap	20 grains.
Water	sufficient to produce 3 fl. ʒ

Dissolve the thymol and soap in the spirit, add the water, and shake together.

Oleum santali and copaibæ are emulsified thus:

Copaiba	1 fl. ʒ
Resin Soap	10 grains.
Water	sufficient to produce 1 fl. ʒ

I have now given a sufficient number of examples to show that resin soap does possess valuable emulsifying properties which, for certain purposes in pharmacy, may be found useful.

Estimation of Alkaloids in Coca Leaves.—Von der Mark recommends the following method: 50 Gm. of the powdered leaves and 20 Gm. of magnesia are moistened with a little water, dried at 60° C., and exhausted with ether. The ether is removed by distillation, and the residue treated with 2 per cent hydrochloric acid; after filtering, the filtrate is shaken with a little ether, just sufficient to remove the coloring matter, ammonia in excess is now added, and again ether. This last operation is repeated three times, employing 25 C.c. of ether each time. The ethereal liquids are mixed, and freed from the small quantity of water they may contain by the addition of some fragments of fused calcium chloride. Finally the ether is removed by evaporation, and the residue dried and weighed.—*J. Chem. Soc.*

Glycerites of Ferrous Salts.

THE liquid preparations of ferrous salts, such as syrup of iodide of iron, have always been a source of trouble to the pharmacist from the facility with which they absorb oxygen and become cloudy, the iron changing to the ferric state. Mr. Arthur has recently pointed out that glycerin, as is well known, has the property of preventing oxidation of ferrous salts, and even of reducing ferric salts to the ferrous state. The sweetness of glycerin also enables it to be substituted for syrup. He is of opinion that glycerites of iodide and bromide of iron might be usefully made thus:

Glyceritum ferri iodidi.—Iron 1 ounce, iodine 2 ounces, water 3 fluidounces, glycerin 27 fluidounces, or a sufficiency. Mix 2 ounces of the water with an equal volume of glycerin in a flask; in this mixture digest the iodine and iron, heating slightly, and occasionally shaking until the froth becomes white; then filter the liquid into 26 fluidounces of the glycerin, rinse out the flask and iron wire, and wash the filter with the remaining ounce of water, mix and make up to 31 fluidounces. The specific gravity should be about 1.300. This glycerite contains 4.3 grains of ferrous iodide in a fluidrachm. A similar preparation is proposed for the glycerite of bromide of iron: Iron 270 grains, bromine 540 grains, water 3 fluidounces, glycerin 26 fluidounces. It is possible that only a portion of the sugar might be replaced by glycerin with quite as good a result. In the latter preparation each fluidrachm contains no less than 5 grains of bromide of iron.—*Monthly Magazine.*

On Belladonnine.

THE name belladonnine is applied to the syrupy mother liquid which is finally left behind after atropine has been made to crystallize out as far as possible. It is a mixture containing:

Belladonnine proper,
Atropine,
Hyoscyamine,
Hyoscine (18 to 20 per cent),

and of their products of decomposition, viz.:

Tropine,
Pseudotropine,
Tropic acid.

E. Dürkopf has recently studied the nature of this complex substance, and it is he who ascertained the presence of hyoscine therein. The crude belladonnine is first acidulated, then treated for a number of days with ether and chloroform, for the purpose of removing certain hydrocarbons and other impurities. After the base has thus been purified, the atropine is caused to split into tropine and tropic acid by the usual methods, whereupon the hyoscine and belladonnine are left behind in solution. The former is easily isolated by converting it into the double gold salt.—After *Ber.*, 1889, 3,183.

This new source of hyoscine is likely to diminish its cost.

Chloralimide.

ATTENTION has recently been called to the possible value, as a medicinal agent, of chloralimide: $CCl_3-C\begin{cases}H\\NH\end{cases}$, a substance that must not be confounded with that recently introduced as "chloralamide," which is more correctly designated chloral formamide (*Compt. Rend.* 109, 817). Chloralimide was first described by Messrs. Pinner and Fuchs, who obtained it by the action of ammonium acetate upon chloral hydrate (*Berichte*, x., 1068); but Messrs. Behal and Choay now claim that it can be obtained in a state of greater purity as a residue from the action of heat upon chloral ammonia. The product so obtained is described as forming long, colorless and tasteless needles, slightly soluble in water, rather soluble in alcohol, and very soluble in ether.

It is very stable, not being altered by air, light, or moisture, or by heating in a sealed tube to 150° C. in the presence of water, but at 180° it is said to be decomposed into chloroform and formamide. In contact with a liquid acidulated with a mineral acid, it is stated to be decomposed into chloral and the corresponding ammonia salt, but this reaction does not occur with organic acids (*Répertoire*, March 10th, p. 109). Further, it is affirmed that in doses of 0.25 to 0.50 Gm. chloralimide has been ascertained to possess remarkable antipyretic and analgesic properties. M. Choay also claims that it would surpass chloral ammonia or chloral formamide in activity, since an equal weight would yield more chloroform than either; whilst it presents the advantage of being stable and free from unpleasant taste and odor.

Mr. Ritsert, referring to this substance (*Pharm. Zeit.*, March 15th, p. 166), points out that the name applied to it, chloralimide, is not free from objection, since chloral, as an aldehyde, is characterized by a hydroxyl group which is no longer present in this compound.

He thinks it would be more scientific to speak of it as trichlor-ethyliden-imide. Further, the statement that the compound is split up, by heating to 180°, into chloroform ($CHCl_3$) and formamide ($HCONH_2$), and by mineral acids into chloral and ammonia salts, is considered by him to be in contradiction to what is known of the decomposition of chloral, and he thinks proof is required that the compound so described corresponds to the formula attributed to it or is identical with the chloralimide prepared by Pinner.—*Pharm. Journ.*

Iodate of Calcium as an Antiseptic.

FROM a paper on the above subject, by W. Dunnett Spanton, in the *Provinc. Med. Jour.*, we take the following portion:

Iodate of calcium was formerly little known, and I found difficulty in obtaining it from the chemist, who more than once sent me iodide of calcium in its stead. Fortunately for me and for the subject of my experiment, I knew the difference between them, and discovered the error before using it; for the iodide is a comparatively poisonous salt, and in small doses will produce very unpleasant effects. Of this I had been warned by my friend Mr. Sonstadt, and any one intending to use iodate should make quite certain that he does not get iodide instead. My experiments confirmed to a large extent those described by Mr. Sonstadt, and I have now in my possession several of the specimens I put up seventeen years ago.

One, a bottle of *fresh urine*, to which a small quantity of iodate of calcium was added, has now no odor except that of iodine, whereas the fellow-specimen without the iodate is, of course, putrid. Another, containing some boiled meat, is quite devoid of any odor of putridity; its fellow is intolerable. About the same period a patient brought to me a specimen of lumbricus in water, and to this I added a few grains of iodate and put it aside. After a time it became almost the color of iodine water; then it would become clear again, become dark again, and it is now clear, smelling strongly, and only of iodine. The worm is more or less disintegrated, but the fluid is clear and has never at any time had the slightest putrid smell.

One curious property which the salt has is that of retaining *urine* clear when added to it while fresh. Acting upon this knowledge, I employed it in some cases of chronic cystitis, in which the urine was very offensive, with excellent effect. When used for washing out the bladder, and given by the mouth in these cases, it had the effect of clearing the urine and greatly diminishing the fetor, though I found boracic acid, on the whole, more efficient, and have generally used it on that account.

As a dressing for wounds of all kinds, for recent amputations and injuries, as well as for suppurating or sloughing wounds, it certainly is useful as an antiseptic. My experience of it in these cases led me to the conclusion that its insolubility (requiring about 400 parts of water for solution) was a drawback, as that strength is not enough to produce a sufficiently prolonged effect upon the discharges to keep them antiseptic. Although one could use the powder itself, I think its action is too slow for its full effect to be realized. I find, in some notes I published nine years ago on excision of the tongue, a solution was found to have an excellent effect as a wash for the mouth, and four days after operation no fetor could be observed in the breath (*Lancet*, 1881, vol. i., page 911). With its internal use I was never able to convince myself that it had any marked effect, except in cases, such as I have referred to, where there was cystitis or a superabundance of lithates in the urine. It occurred to me that its marked effect upon the condition of the urine might render it useful for uric-acid calculus, and I gave it in some cases of renal calculus with this view. I am not able, however, to say that any well-marked effect was observable. Knowing the action of lithium on the uric-acid diathesis, it might be found that, if an iodate of lithium is procurable, it might prove an active and useful drug for this affection.

So far as my experience has gone, I found the insolubility and the slowness of its action the chief drawbacks to the utility of iodate of calcium as a surgical application; but its innocuous and unirritating properties, and its marked effect upon the renal secretion, indicate a special advantage in its use for such cases as cystitis, nephritic abscess, and for renal operations generally. So many of our best antiseptics are poisonous, or irritate, or stain, that it is useful to have one such as this which is free from those drawbacks. It has at least the merit of being inodorous and almost tasteless, and of not disguising other odors by a still worse one of its own.

Presence of Mercury in a Dislodged Tape-Worm.—Ludwig Oelkers reports that he has had occasion to examine pieces of a tape-worm which had been discharged by a person treated for syphilis by mercurial inunction, about 6 av. oz. of mercurial ointment having been rubbed in at various times in the course of a year. The peculiar gray tint noticed in the joints of the tape-worm attracted attention, and excited suspicion of the presence of mercury therein.

The writer was able, by appropriate manipulations, to separate a globule of mercury from several segments of the worm, but did not determine the form in which the mercury existed in the parasite.—*Berichte*, 1889, 3316.

Partridge Poisoning.

In the provinces of the Dominion of Canada cases of partridge poisoning are not infrequent, but medical attention has been little bestowed upon their symptomatology and treatment. The Nova Scotia Branch of the British Medical Association discussed the subject at its January meeting. The *Maritime Medical News* reports the remarks of Dr. Campbell, of Halifax, who had found the cause of the poisonous state of the flesh of the birds in the ingestion by them of the leaves and seeds of the *Kalmia angustifolia;* or "sheep laurel," also known as "lambkill." Both the leaves and the seeds are poisonous. After eating of this plant, sheep will foam at the mouth, and lambs become convulsed and may die. In regard to the effects of the poisoned partridge flesh upon the human heart, Dr. Campbell could not agree with the prevailing belief; he had not found the pulse so weak and slow as some had reported. It has been stated by some that the pulse has been rendered so extremely weak and slow as to be imperceptible. The treatment of partridge poisoning should be with stimulants by injection and by the mouth, preparations of ammonia, alcohol, etc., with heat applied to the feet and warmth to the body generally. There is commonly no need for an emetic, since the poison itself tends to produce free vomiting.—*N. Y. Med. Jour.*

Californian Honey.

A review of the 1889 honey crop, lately received from San Francisco, states that last year the crop has not been as large as in 1888; but nevertheless sufficient quantities have been produced so that no scarcity has been felt during the season, and even now there is sufficient honey on hand, as the demand for export has not been active. It is impossible to name exactly the quantity of extracted and comb honey produced in California, but the crop in California for 1889 may be estimated at 2,000,000 pounds of extracted honey and 200,000 pounds comb honey. In 1888, California produced 3,500,000 pounds; 1887, 1,200,000 pounds; 1886, 5,000,000 pounds; 1885, 1,250,000 pounds; 1884, 9,000,000 pounds, or an annual average of nearly 4,000,000 pounds. It is difficult to approach again the amount produced in 1884, for the reason that a great deal of land is now cultivated, so that the bee-stands had to be removed further back into the mountains, and some apiarists have given up this industry, as they have found other occupations more profitable. The prospect for the coming season is so far a very good one. There has been an abundance of rain, and if there should be some rains again in March or April to keep the different kinds of trees and flowers in blossom, there will probably be a larger yield of honey than there has been since 1884. But a great deal depends upon the weather during the honey-producing months, which are, in particular, May, June, and July.—*Journal of Commerce.*

A New Test for Glycerin.

In the following qualitative test for glycerin, advantage is taken of two characteristic reactions:

1. The formation of acrolein by the distillation of glycerin with acid potassium sulphate, according to the equation:

$$\underset{\text{Glycerin.}}{C_3H_5(OH)_3} = \underset{\text{Acrolein.}}{C_3H_3(OH)} + \underset{\text{Water.}}{2H_2O}$$

2. The red coloration produced in a solution of rosaniline, decolorized by means of sulphur dioxide, by acrolein, as by aldehydes (Schiff and Caro's reaction).

To carry out the test, the solution containing the glycerin is evaporated down to about 5 to 10 C.c. in a small porcelain dish, about 1 Gm. of powdered acid potassium sulphate added, the whole well mixed together and then brought to dryness on the water bath. The residue is transferred to a hard glass tube, 3 to 4 inches long, fitted with a cork and exit tube, the latter passing into a test tube containing water. On heating the tube, the acrolein is readily evolved, and is dissolved by the water in the test tube. The contents of the latter can be tested for the presence of an aldehyde in the usual way by the addition of a few drops of Schiff's reagent. Both before and after the addition of the reagent, the solution in the test tube should be well shaken; the color only develops slowly, and reaches its maximum after fifteen to twenty minutes' standing. If the aqueous solution happens to have got warm by the condensation of steam evolved during the distillation, it must be cooled before adding the reagent, since the latter turns red on warming in the absence of an aldehyde.

The delicacy of the reaction has been tested by Mr. J. T. Conroy and Mr. B. W. Jones, with the result that it is possible to detect 0.15 Gm. of glycerin in this way, or, in round numbers, 1 part of glycerin in 650 parts of water by evaporating down 10 C.c. of the solution, and therefore 1 part of glycerin in 6,500 parts of water by evaporating down 100 C.c.

The reaction is not given by any of the following substances: Mannite, cane sugar, grape sugar, milk sugar, starch, dextrin, albumen, gelatin, stearic acid, and oleic acid; but the carbohydrates interfere with the delicacy of the test, owing to the fact that their distillation products with acid potassium sulphate hinder the formation of the red color with the rosaniline solution. To carry out the test in presence of sugar, the latter must first be removed by evaporating the solution in the presence of calcium hydrate and sand, or of calcium hydrate and calcium carbonate, and extracting the residue with a mixture of 2 parts of alcohol and 1 part of ether. On evaporating the extract with acid potassium sulphate, and distilling the residue, the reaction is obtained as above; but it is not possible to detect less than 0.03 Gm. of glycerin in the presence of much sugar, or 1 part of glycerin in 3,300 parts of water by evaporating down 100 C.c. of the solution.

The reaction must be similarly applied in testing for glycerin in wine and in beer; the limit of its delicacy in these cases is the same as above. In testing milk for glycerin, the casein, albumen, and sugar should be first removed.

Fatty acids do not interfere with the delicacy of the reaction. Compared with other color reactions for glycerin, this test appears more characteristic, though not quite so delicate as Reichel's phenol test.—Abstract of paper by Chas. A. Kohn in *Jour. Soc. Chem. Ind.*

Morphine Salts and Hydrocyanic Acid.

Prof. J. M. Maisch calls attention to an item lately going the rounds of pharmaceutical journals which declares a mixture of morphine with cherry-laurel water to be incompatible and dangerous to life. He says: "In a paper published in the *American Journal of Pharmacy* in June, 1871, page 258, I stated that hydrocyanic acid does *not* precipitate neutral solutions of morphine. The same paper details some experiments made by me with neutral salts of morphine and alkali cyanides, which were shown to precipitate the morphine so completely that the filtrate will yield no further precipitate with potassio-mercuric iodide. The crystalline precipitate I supposed to consist of morphine hydrocyanide, but Prof. Flückiger subsequently showed that under the conditions mentioned the alkaloid morphine is precipitated, and that a morphine cyanide does not exist. The error in the above statement can only be explained by the improper preparation of the cherry-laurel water used. If made by distillation from the leaves, it cannot contain a cyanide, and the free hydrocyanic acid will not cause a precipitate. Very likely the water was prepared by means of magnesia, in which case it must have contained magnesium cyanide, which would precipitate morphine. It is proper to add that in the paper quoted (*N. Jahrb. f. Pharm.*, No. 38, page 138), Prof. Flückiger also shows that berberine, quinine, cinchonine, and strychnine likewise do not form cyanides under similar circumstances."—*Amer. Jour. Pharm.*

Estimation of Quinine in Mixtures.

In the course of a paper on "The analysis of medicines dispensed from physicians' prescriptions, and a rapid method of estimating quinine in medicine," by Dr. Seaton and Mr. H. D. Richmond (published in the *Analyst*, 1890, 42), we take the portion particularly relating to *quinine:*

Certain objections to the general adoption of the ammonia and ether process have led us to the suggestion of the following method, which we found to be perfectly reliable within certain limits, and which has the advantage of being rapid and inexpensive. We do not recommend it in substitution of the ammonia and ether process, as the final method of determining the proportion of quinine in medicine, but as a preliminary process which will enable the analyst to decide whether an error in dispensing has been committed sufficient in extent to bring the case within the scope of the Adulteration Act. We have found that quinine bisulphate is neutral to methyl orange, while the base itself has no action on phenolphthalein; and we have, bearing these facts in mind, adapted to the termination of quinine the method of alkalimetry.

We prefer to operate as follows:

To 25 C.c. of medicine add 2 drops of methyl orange (25 Gm. in 1 liter of water) and 2 drops of phenolphthalein (5 Gm. in 1 liter of 50-per-cent alcohol), titrate with one-tenth normal baryta solution until the free acid is all neutralized, which is shown by the red color just changing to brown. Note the number of cubic centimeters used. Continue titration until the pink color of the phenolphthalein appears. Care must be taken not to overstep this last point, as the color does not develop quite immediately. The difference between the two titrations, multiplied by the factor 0.218, gives the weight of the quinine sulphate (*i.e.*, the salt with 7 molecules of water) in grammes in the 25 C.c. The number of cubic centimeters in the medicine prescribed is known, and the calculation becomes a simple proportion.

The method is, of course, not applicable in the presence of salts of which the base is precipitated by baryta.

The following is the result of the estimation of quinine in the same medicines by the volumetric and gravimetric processes respectively. Four samples of medicine were

obtained in the usual way, and it will be seen that the results of the two methods closely correspond :

	Volumetric.	Gravimetric.
1	21.2	20.8
2	23.4	23.2
3	16.5	16.1
4	20.3	20.0

We have further tested the process in the following way : Solutions of quinine, accurately prepared, were obtained by one of us from Messrs. Bell & Co. Solution A contained 12 grains by weight of Howard's quinine sulphate; solution B, 20 grains ; solution C, 18 grains; and solution D, 15 grains. Four samples of each solution were obtained, and they were submitted to the other for estimation by our process.

The process gave the following results :

A (12 gr.)	found respectively	12.1	12.2	11.8	12.0
B (20 gr.)	"	19.7	19.9	19.9	19.7
C (18 gr.)	"	17.5	17.6	17.5	17.8
D (15 gr.)	"	15.4	14.7	14.9	15.2

Reactions and Tests of Phenacetin.

SOME time ago Mr. J. Luettke proposed several new reactions and tests by which the identity and purity of phenacetin could be more fully established.

When phenacetin (15 Gm.) is boiled for a considerable time with diluted hydrochloric acid (25 Gm.), the former is decomposed and converted into hydrochlorate of amidophenetol. The latter yields a blood-red color with ferric chloride, and this may be used as an identity reaction for phenacetin, thus:

Upon boiling phenacetin with diluted hydrochloric acid, and afterwards adding ferric chloride, the liquid must acquire a blood-red color.

To prove the absence of diamido compounds, a small portion of the substance is brought into contact with nascent chlorine. This is best done by triturating about 0.5 Gm. of chlorinated lime with a little hydrochloric acid to a thin paste, and then adding about 5 grains of phenacetin. If any diamido compounds are present, there will be a color (blue, violet, etc.) developed; if the phenacetin was pure, the mixture will remain colorless.—After *Pharm. Centralh.*

Test for Cottonseed Oil in Lard.

MR. FRANK P. PERKINS makes the following communi cation to the *Analyst* (1890, 51):

The following may be used in *sorting* samples of lard which have to be examined for cottonseed oil:

I find that if a little powdered potassium dichromate, about 0.2 to 0.3 Gm., be mixed with a few drops of concentrated sulphuric acid in a porcelain dish, and a small portion, about 5 Gm., of the suspected sample be then introduced, on stirring well a second time, adding water, and stirring again, there will, in the presence of cottonseed oil, be developed a green color, due to the change of chromic acid to chromic oxide; but if the vegetable oil be absent, the yellow color of the dichromate will still prevail. The color should not be judged until water has been added and the mixture stirred for some seconds.

This test I have tried with samples of bladder lard, the same containing a certain proportion of cottonseed oil, and with cottonseed oil itself. It has not failed to detect the cottonseed oil, either alone or when mixed with lard. How the test is affected by other vegetable oils I have not yet determined; I therefore submit it with diffidence, and should be glad to know how it answers in the hands of other experimenters.

The Analysis of Carbolic and Sulphurous Disinfectant Powders.

FROM a paper on this subject by Dr. John Muter, read at a recent meeting of the Society of Public Analysts, we take the following (after the *Analyst*, April, 1890):

The ordinary *cresol* of commerce usually contains some naphthalene (naphthalin), and a rapid method of getting a fairly accurate idea of its amount is a desideratum. This presence of naphthalene is often preferred by the purchasers, who have the idea that if "commercial carbolic acid" becomes milky when put into water, it shows its strength. The process I have devised is as follows:

Fifty C.c. of the acid are shaken up with 200 C.c. of 10-per-cent solution of sodium hydrate, when the acids readily dissolve, leaving the naphthalene floating on the top. The bottom liquid layer is run off, a washing of 5-per-cent solution of sodium hydrate is put on, and the whole is rapidly filtered through a quick filter and allowed to drain. The collected naphthalene is rinsed off the filter into a small beaker with water, and is then once more collected on a pair of counterbalanced filters in the usual manner. After draining, the filters are removed from the funnel and dried as far as possible between blotting paper by judicious pressure. The filters are separated, and the inner one and its contents are weighed, using the outer one as a tare. The amount of moisture held by the two filters is sufficiently alike to enable us to get a very fair approximation of the true amount of naphthalene, quite near enough for ordinary purposes.

Taking now the analysis of *sulphurous* powders, the process I use for the estimation of the available sulphurous acid is as follows:

Two Gm. of a fair sample of the powder are placed upon a small filter and percolated with anhydrous ether until the phenols and tarry matters are removed, which is readily and quickly attained. Fifty C.c. of decinormal iodine solution are then placed in a bottle, and as soon as the ether has dried off from the powder, the contents of the filter are dropped into the bottle. The bottle is allowed to stand for half an hour (being shaken at intervals), and finally the contents of the bottle are titrated back with decinormal "hypo" in the usual manner. The amount of iodine destroyed, of course, represents the available sulphurous acid in the 2 Gm. of powder started with, and, therefore, it is only needful to multiply the number of cubic centimetres of iodine used by 0.0032. This method I find to work well with every sort of powder in the market, provided its base be not lime. To get a really satisfactory process in the presence of a lime base is very troublesome, and I cannot say that I have yet met with one that is at once rapid and good.

We come now to the important question of "reversion." Sulphurous powders oxidize with great rapidity, and a perfectly honestly manufactured one may, if badly kept for even a very short time, show on analysis a much smaller portion of available sulphurous acid than it ought to do. It is, therefore, the duty of an analyst desirous of holding the scales of justice fairly, to try, if possible, to ascertain the amount of such reversion. With a powder made on a gypsum base and with calcium bisulphite I am not aware that this is attainable; but many of the leading makers, recognizing this, are so constructing their powders as to render it possible. Some use a purely silicious base, containing only a neglectable quantity of sulphate, while others use a gypsum base but put in the sulphite in the form of a specially manufactured sodium salt. It would at first sight appear that the analysis of such a powder is a very simple matter, but this is not so. The whole thing is complicated by the fact that the moment water is put upon the powder a double decomposition occurs, and we get insoluble calcium sulphite and sodium sulphate, and we find in practice nearly the whole of the sulphurous acid in the insoluble residue. To get at the reversion in such powders I have devised the following method:

Twenty Gm. of the powder are put into a bottle, and 200 C.c. of water are measured in with a pipette. After an occasional shake the whole is allowed to settle, and some of it is poured off or filtered through a dry filter. The decomposition above alluded to often occurs at this stage of the process; but, as will be seen, the latter is not thereby affected. Twenty C.c. of the liquid (equal to 2 Gm. of the sample) are mixed with an excess of bromine, and filtered from any bromo-cresol remaining undissolved. It is then treated with an excess of barium chloride, and the total sulphuric acid is weighed as barium sulphate. As, however, a part of this is due to dissolved calcium sulphate, another 20 C.c. are precipitated with ammonium oxalate, and the lime weighed as carbonate. The calcium thus found is now calculated to its equivalent amount of sulphuric acid, and this is deducted from the total. The remainder is still further reduced by deducting an amount of sulphuric acid equivalent to the sulphurous acid previously found by the iodine method, and the remainder represents the reverted sulphurous acid, and is calculated as such.

If the powder be made with a silicious base, it may be more convenient for those who only perform the analysis now and then, and who prefer a gravimetric method, to proceed as follows:

Drop 2 Gm. of the powder into a beaker containing an excess of bromine water, and while this is acting take another 2 Gm., put it into a dish, and moisten with fuming hydrochloric acid (containing no free chlorine). Now evaporate to dryness, redissolve, and then throw down the sulphate with barium chloride in both parts. The difference between the two results calculated to sulphurous acid will give the amount of that body present in the 2 Gm. of sample taken. If the base be all but free from sulphates, we thus get a fair idea of the probable reversion at the same time.

Tri-iodide of Caffeine occurs in the form of green crystals, oblong prismatic in shape, fluorescent, and readily soluble in water and also in alcohol. The formula is $3(C_8H_{10}N_4O_2I_3).3H_2O$. The crystals easily decompose, and in gathering must be washed very carefully with dilute alcohol slightly acidulated with hydriodic acid. The alcoholic solution soon becomes brown and polarizes light exactly as does the iodoquinine sulphate solution, the two substances closely resembling each other in several other particulars. According to Mortimer Granville, the tri-iodide of caffeine is destined to become a very valuable iodine preparation, as it decomposes rapidly in the stomach, and is free from the inherent defects of the alkaline iodine salts and those composed of iodine and quinine.

Effects of a large Dose of Antifebrin.—Dr. Hartge, of Dorpat, reports a case of a student who took between 28 and 29 Gm. (about 420 grains) of acetanilide. There was no loss of consciousness, motion, or of sensation; no albuminuria or hæmoglobinuria, and only a slight jaundice. Although, as in aniline poisoning, the blood became of a dark blue, the corpuscles presented a normal appearance. Respiration was rapid and irregular, and the pulse was quickened. There was insomnia and cardiac palpitation and dyspnœa, with a feeling of impending death. When seen several hours after the drug had been taken, the skin was bluish over the entire surface, and markedly about the eyelids, chin, and temporal regions. There was no puffiness, as in severe asthma, and the general appearance was different from that of cyanosis. Although there had been no previous vomiting, a glass of red wine came up immediately, and was followed by vomiting of bilious matter. Sulphate of soda, coffee, and brandy were given by the mouth, and camphor and ether hypodermatically, with cold to the head. On the third day the patient was up and the blueness had entirely disappeared.—*Br. Med. Journ.*

The New Swiss Pharmacopœia.—This new Pharmacopœia describes about eight hundred medicines, and is published in German, French, and Italian. The various articles are arranged alphabetically according to their Latin titles. The *Pharmaceutische Zeitung* states that amongst the features of the Pharmacopœia are particulars as to what is meant by "powder," beginning from the finest grade, and designating coarser kinds by numbers. The specific gravities of tinctures are given; there are three sorts of extracts (fluid, soft, and dry). Solutions are designated by the word "Solutum," in preference to "Liquor," these preparations occurring in the order of the names of their chief component, as for example, "Kalium aceticum solutum" [= "dissolved acetate of potassium"]. Amongst the new departures are to be noted the preparation of a few syrups from fluid extracts, and the standardization of potent preparations such as extract of nux vomica.—*Chem. and Drugg.*

Sugar-coating Pills.—Hecker's method consists in drying the pills, then moistening them with a little syrup in a saucer, then placing them upon a sheet of paper covered with a thin layer of powdered sugar [this should be what is known as confectioner's sugar.—ED.], where they are to be rolled about until completely enveloped. They may then be placed upon a hair sieve to remove excess of sugar, and dried without heat (which is liable to crack them). The process may be repeated, if desirable, after another drying. While inferior to machine coating, these pills may, by a little practice, be made very white and round.—*Chem. and Drugg.*

Colored Antiseptics.—Some time ago the Paris Academy of Medicine decided to recommend that midwives be allowed to procure and use a solution of corrosive sublimate as an antiseptic. Subsequently the question arose as to the coloring agent which should be used to give it a distinctive tint. Indigo blue, in definite quantity, has now been selected, so that henceforth, after the Academy's recommendations receive the expected ministerial sanction, pharmacists will be allowed to deliver to licensed midwives, on their written order, powders composed as follows:

Corrosive Sublimate	0.25 Gm.
Tartaric Acid	1.00 "
Five per cent of Alcoholic Solution of Indigo-carmine	1 drop.

Mix and dry. Label each paper with the regulation orange-red label, bearing the inscription (French, of course): "Corrosive sublimate, 25 Gms. For one liter of water. Poison." The solution is to be used for antiseptic washes and dressings, and its distinct blue color is meant to prevent its being mistaken for other liquids commonly found in domestic economy. As the law stands at present, pharmacists have no right to give to midwives any poisonous antiseptics.—*Chem. and Drugg.*

Depreciation in the Strength of Jalap.—Prof. Flückiger remarks the loss in strength which jalap has undergone since 1842, when Guibourt found 17.60 per cent of resin, though at that period various samples yielded from 10 to 17 per cent. Nowadays the yield of resin is scarcely more than 12 per cent at best, yet roots bought in the fields around the City of Mexico gave 16.9 per cent of resin. The explanation is said to be that Mexican dealers steep the roots in alcohol, whereby some of the resin is extracted, and, after drying, the appearance of the roots is unchanged. The resin extracted is sold as jalapin, or resin of jalap.

Jalap grown in Germany has yielded as much as 22.73 per cent of resin.

Percolation of Green Drugs.—The *Pharmaceutische Post*, of Vienna, and other pharmaceutical journals, have been calling attention to this subject. One of our contemporaries says: "Green drugs present an obstruction to percolation extraction by the fact that the large amount of water present in their tissues dilutes the percolate, so that it is impossible to use ordinary spirit for maceration, and prepare a tincture without much evaporation; and if the alcohol is very strong it contracts the tissues, reducing the surface of the plant to the state of a tough, leather-like substance, which quite prevents the rapid circulation of the liquid." There is another most vital consideration to be taken into account, namely, that the strength of the product, that is, the dose, is very much greater than if the dry plant has been used; and with powerful drugs like belladonna or hyoscyamus, etc., this consideration is of paramount importance.

The Uses of Ichthyol.—The therapy of ichthyol is being gradually developed, and the latest authority, Professor Gadde, agrees with others that its use is indicated wherever there are enlarged veins or abnormalities of circulation; hence he recommends it in all skin diseases, in chronic rheumatism, and in nephritis, and describes a case of diabetes where, by internal application of ichthyol, the amount of excreted sugar decreased from 7.1 to 0.5 per cent in a month. The remedy was administered in aqueous solution or in pill form; externally, Gadde used a 50-per-cent ointment with lanolin.—After *Chem. and Drugg.*

Detection of Methylated Spirit of Nitrous Ether.—Mr. John Muter speaks of this as sold in England by cutting stores and oil men, and suggests, as a ready method for its detection, placing some of the suspected spirit in a glass with a lump of solid caustic potash the size of a small bean, and then stirring until nearly dissolved. The genuine B. P. spirit will lose all its odor of nitrous ether, and, after standing for half an hour, will not have turned darker than a pale straw color, when it will have only the odor of plain rectified spirit. The methylated article will become a deep yellow to orange red, and have the characteristic odor of methylated spirit.

Antiseptic Ligatures.—Wrap the E and A violin strings loosely upon glass spools, and, after covering them with ether for twenty-four hours, remove them, thread the spools on to a glass rod, and allow the ether to evaporate, avoiding contact with anything meanwhile. When they are dry, immerse them in a solution of 1 per cent of corrosive sublimate in diluted alcohol; after one-half hour remove them, and wipe the gut with a towel that has previously been washed in a 1-per-cent solution of the corrosive sublimate in water. Place the spools in a bottle containing oil of juniper, where they should be immersed at least ten days before being used.—E. Q. THORNTON, *Amer. Jour. Pharm.* (Thesis).

Gum Ghatti, being the subject of a paper by C. F. Henry, is said by him to produce a mucilage of bland and not unpleasant flavor. Only 75 per cent of the gum is soluble in water, even with a boiling temperature; the residue increases considerably in bulk, however. A 1:3 mucilage is of greater density than a B. P. mucilage of gum arabic, and possesses much greater adhesive properties. As regards cost, an ounce of ghatti gum produces about twice as much mucilage as a similar amount of acacia and at one-twelfth its cost.

Salicylate of Sodium, when added to spirit of nitrous ether or solution of acetate of ammonium, has been found to give a dark reddish discoloration, and Prof. Charteris, of Edinburgh, has ventured an opinion that it may be owing to impurities contained in the artificial salicylic acid. Mr. C. F. Henry has made some comparative experiments with the artificial and natural acids, and finds the discoloration much more decided in the case of the latter. The color formed more quickly, becoming, with the spirit of nitrous ether, at first olive green and then reddish brown, or, with sal volatile, at first reddish and then dirty brown.—*Pharm. Jour.*

Japan Wax.—The preparation of vegetable wax is one of the principal industries of the island of Kiu Siu. The wax is gathered in the most primitive manner from the berries of the Rhus succedanea (Hazenoki tree). In some districts hydraulic presses have been introduced for its preparation, but the result has not been satisfactory. The best wax is produced in Kumamoto, but does not appear in commerce, as it is all sent to the imperial court. The best commercial wax is made in the province of Hizen, and brought into commerce via Osaka. The traders in that place are better capable of purifying and bleaching the wax than the peasants in Kiu Siu. In Japan the wax is largely used for candles and in the preparation of hair ointment.—*Brit. Cons. Rep.* (*J. Soc. Chem. Ind.*).

Detection of Free Chlorine in Hydrochloric Acid.—According to Kupferschlaeger, pure concentrated hydrochloric acid diluted with one-fourth its volume of water does not attack granulated copper until heated at 200° C., but slight traces of chlorine determine the solution of the metal in the cold, with consequent coloration of the acid.

Although pure hydrochloric acid has no action on phosphorus, in the presence of free chlorine an action obtains, and the solution produced gives a coloration and precipitate with ammonium molybdate.

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EDITORIAL.

ONE of the burning questions connected with the present revision of the U. S. Pharmacopœia is undoubtedly that of standardization of preparations derived from vegetable drugs. Though it is quite likely that this number of our journal will not reach many of its subscribers before the matter has been discussed and decided by the Convention, yet we anticipate that this decision will leave a large share of responsibility and discretion with the Committee of Revision, in so far as to leave it at liberty to prescribe definite standards only in such cases in which our present methods of assay are capable of furnishing positive proofs not only of the *quantity* but also of the *quality* of the proximate principles which the respective drugs are known to contain, and upon which their therapeutic properties depend. We have already on a former occasion (see our January number) put ourselves on record that we are by no means, from principle, opposed to standardization. On the contrary, we have declared our approval of definite standards, when these can be determined with reasonable certainty and without complicated processes. But a considerable experience in assaying various pharmaceutical preparations made from vegetable drugs has convinced us that we have not yet arrived at a point even half-way to certainty in a great many cases. If an assay, so-called, is to consist of throwing down, for instance, an alkaloid by means of some precipitant, and the strength of the drug in alkaloid is to be merely determined from the volume of the reagent necessary to completely precipitate the principle, we maintain that this is not any surer criterion of its quality or strength than if we were to attempt to estimate the quantity of sulphuric acid or of a sulphate in any aqueous liquid by merely noting the quantity of baric chloride consumed until no further precipitation takes place. Just as much as in the latter case a quantitative determination is absolutely worthless, or at least untrustworthy, unless supported by a qualitative examination, which will enable us to so arrange matters that *nothing but* sulphuric acid can, under the given circumstances, be finally precipitated by the barium salt, so also is a mere precipitation of proximate principles, in a liquid preparation derived from a vegetable drug, without any positive value unless it can be shown that the substance precipitated by the reagent has actually pre-existed in the drug, belongs to it, and has not been added, accidentally or fraudulently, to produce the expected precipitate, or at least to produce a precipitate of an expected or required quantity.

It has been argued that the absence of any ready means of combining reactions of identity with alkaloidal assays need not be regarded as an objection to the employment of the latter, inasmuch as it should not be assumed, *a priori*, that a pharmaceutical preparation has been fraudulently manipulated. Yet, after all, what is an assay for? Evidently to enable one to arrive at a safe conclusion regarding the quantity of some *definite* substance. We fail to see how any positive or reliable conclusions can be based on an assay where the *nature* or *identity* of the substance remains unknown or can be established only by tedious, elaborate, and expensive processes.

While we believe that the establishment of definite standards, to be determined by so-called assays, would, *at the present time*, be premature, we do not doubt that it will become possible in the future. It will require a number of years of careful study to work out processes which will be reliable, free from tedious complication, and satisfying every requirement. If the Convention of 1890 should adopt a resolution instructing the Committee of Revision to provide standards of strength and to establish methods of assay for vegetable drugs *and their preparations*, the Committee might not find it possible to carry out the instruction, or it might possibly result in the introduction of methods of assay which will shortly be shown to be unreliable. This would, of course, be worse than not to introduce them at all.

It seems to us wisest, at the present time, to go ahead slowly in this matter, but to keep the goal in view, so that at the next revision (in 1900) there may be a fair prospect of coming before the profession with something that is trustworthy and free from objections.

In the present revision, one important step might well be taken, namely, to state (merely as a matter of information, but not of requirement) in connection with such drugs, where it may be deemed advantageous, that, when of good quality, it contains a certain stated quantity (or certain upper or lower limits) of alkaloid or other principles, and to give in connection therewith a process of assay. If then any one wishes to apply this process of assay to any *preparation* made from the drug, he may do so, but there should be no compulsion to make the preparation of an *exact* strength *at this revision*, except in the case of Opium, Nux Vomica, Cinchona, and a few other drugs where it is not difficult to establish the identity of the final product.

If the physician is anxious to adopt an exactly standardized preparation representing such drugs as Coca, Pilocarpus, Conium, Physostigma, etc., and he has no confidence in the usual pharmaceutical preparations (fluid extracts, tinctures, etc.) derived from these drugs, all he need do is to employ solutions of the respective alkaloids —cocaine, pilocarpine, coniïne, physostigmine—or of their salts. Up to the present time the recorded experience of the medical profession, so far as pharmaceutical preparations of the above drugs are concerned, has been mainly based upon the usual commercially available brands of fluid extracts, tinctures, etc., made without assay, and yet a pretty unanimous opinion has been arrived at regarding the proper doses in which these preparations should be given to attain a certain object.

THE Seventh Decennial Convention for Revising the Pharmacopœia met in Washington on Wednesday, May 7th, and continued in session until Friday at noon. Although the number of bodies accredited with delegates was larger than ever before, the actual attendance was not much greater than in 1880, the notable difference being the preponderance of the pharmaceutical element. Much delay was caused by the neglect of many bodies to send credentials to the president of the former convention, in compliance with his call, and it was not until Thursday morning that the convention finally elected its officers and appointed its Committee of Revision, as follows: President, Horatio C. Wood, M.D., of Philadelphia; Vice-Pres-

idents, W. S. Thompson, D. W. Prentiss, M.D., and J. M. Flint, M.D., of Washington, A. E. Ebert of Chicago, and J. W. M. Searby of San Francisco; Secretary, H. A. Hare, M.D., of Philadelphia; Assistant Secretary, G. H. C. Klie, of St. Louis. For Committee of Revision, Charles Rice, Ph.D., of New York (subsequently elected chairman); Prof. James P. Remington, of Philadelphia; Prof. F. B. Power, of Wisconsin; Prof. P. W. Bedford, of New York; Dr. W. M. Mew, of the Army; Dr. John Godfrey, of the Marine Hospital Service; Dr. J. M. Flint, of the Navy; Prof. J. M. Maisch, of Philadelphia; Prof. Roberts Bartholow, of Philadelphia; Prof. C. O. Curtman, of St. Louis; Dr. F. A. Castle, of New York; Dr. N. S. Davis, Jr., of Chicago; Prof. C. Lewis Diehl, of Louisville; Dr. R. G. Eccles, of Brooklyn; Dr. W. G. Gregory, of Buffalo; C. Mohr, Ph.D., of Mobile; Prof. G. F. H. Markoe, of Boston; Prof. Oscar Oldberg, of Chicago; Prof. L. E. Sayre, of Kansas; Prof. Otto N. Wall, of St. Louis; Dr. Thomas F. Wood, of Wilmington, N. C.; Prof. H. H. Rusby, of New York; A. B. Taylor, of Philadelphia: Dr. R. T. Edes, of Washington; Prof. C. S. N. Hallberg, of Chicago. The president, Dr. Horatio C. Wood, was afterwards made a member *ex officio*.

The final report of the Committee of Revision and Publication was, in the main, as follows:

Immediately after the close of the Convention the Committee organized by electing officers, and a second meeting was held before the members left Washington. At these meetings the general plan for carrying on the work of revision was discussed and a number of preliminary details settled. As it was impossible to hold frequent meetings, owing to the distances separating the members of the Committee, it was decided to carry on the interchange of discussions and arguments, and the voting on motions and propositions, by means of circulars.* There being no funds at the disposal of the Committee of Revision for paying its current expenses, a proposition made by the Finance Committee to borrow $1,200 for eight months was adopted. This loan was subsequently reduced to the sum of $800 and extended for six months longer.

In September, 1880, a third meeting of the Committee was held at Saratoga, at which Albert M. Prescott, M.D., of Ann Arbor, and Emil Scheffer, Ph.G., of Louisville, were elected members in place of T. G. Wormley, M.D., and Edward R. Squibb, resigned.

Concerning the changes made in the text of the Pharmacopœia, and all other details of general interest regarding the work of revision, a report has already been published in the preface of the Pharmacopœia, pages xxvii., xxviii., reference to which is invited.

When the manuscript of the work was near its completion, the Committee on Copyright, which had meanwhile been appointed, solicited bids for the publication of the work. Six bids having been received in response to this invitation, the Committee accepted that presented by William Wood & Company. After a full discussion their action was subsequently ratified by a majority vote of the whole Committee. The work was then put to press, and was issued to the public during the last week of October, 1882. A vote was passed shortly afterwards that the right to use the text of the Pharmacopœia for purposes of comment be granted to applicants upon such terms as the Finance Committee might deem equitable. Only one publishing house, viz., Messrs. J. B. Lippincott & Co., of Philadelphia, availed itself of this offer, paying a royalty of $100 for the privilege.

On September 9th, 1882, the Committee lost by death one of its members, Dr. Benjamin F. Gibbs, U.S.N. The vacancy was filled in April, 1883, by the election of D. Webster Prentiss, M.D., of Washington. Previous to this election a plan for filling vacancies in the Committee was adopted, according to which only delegates to the Pharmacopœial Convention should be regarded as eligible. A fourth meeting of the Committee was held at Washington on September 11th, 1883. During the year 1884 the advisability of publishing a supplement, authorized by the last Convention, was discussed. After a careful consideration of the claims advanced in favor of a number of new drugs, chemicals, and preparations, it was decided that none of them appeared at that time to be equal in rank or value to those already official, and that, therefore, a supplement was unnecessary.

Another serious loss befell the Committee through the death, on August 21st, 1885, of Henry B. Parsons, Ph.C. This vacancy has been allowed to remain unfilled. During the year 1886 the Committee undertook to collect statistics regarding the frequency with which the various pharmacopœial articles were prescribed in the various sections of the country. A table of the official titles was printed, and copies were furnished to those bodies or individuals who agreed to obtain the desired data. While a number of returns have been received, and the thanks of the Committee are due to the contributors, yet it must be stated that the results are only partially of practical use, since most of them apply to the experience of individuals or limited localities. In 1888 it was resolved to make a collection of criticisms on the Pharmacopœia from the literature published since the issue of the work, and the Chairman was authorized to employ an expert to make the compilation. As a result the Committee has published a digest of criticisms on the Pharmacopœia, in three parts, which, it is hoped, will lighten the labors of the next Committee.

By direction of the last decennial Convention this Committee is required to present a complete plan for the revision of the Pharmacopœia at the present Convention. In obedience to this instruction the Committee has, at a final meeting held on May 6th, 1890, deliberated on the general principles which should, in its judgment, be followed in the next revision.

These general principles, submitted in a separate report, were as follows:

Assay Processes for Drugs—It is recommended that assay processes be appended to the descriptions of the more energetic or otherwise important drugs containing active principles, provided the therapeutic value of the drug depends upon the amount of these principles, and provided also that these principles can be assayed and identified with reasonable accuracy and without requiring complicated processes. The Committee may attach a note stating the usual percentage of these active principles in good commercial samples of the drug, and, if it be found feasible, it may attach a requirement that the drug shall not be used unless it conforms to these stated limits.

Assay Processes for Galenical Preparations.—The Committee may attach assay processes to such galenical preparations as fluid extracts, tinctures, etc., but it shall omit requirements of a definite strength or percentage of active principles except in the case of drugs for which an upper or lower limit, or both, of active principles is prescribed.

Assay Processes for Opium and Cinchona.—In the case of opium and cinchona the Committee shall adopt such processes of assay as will be found to yield the largest proportion of the desired active principles with greatest uniformity and with least manipulative difficulty, the object of these processes being to ascertain how much of the respective principles can practically be extracted.

Descriptions of Chemicals and Tests.—In the case of chemicals the degree of purity, or the allowable percentage of impurity, shall be prescribed as closely as practicable. The standard of purity shall be set as high as practicable for legal enforcement, but not beyond a point reasonably attainable by the manufacturer without subjecting any particular product to unnecessary cost through the enforced removal of some harmless and insignificant accidental impurity.

Chemical Formulæ.—Chemical formulæ shall be given only in the new notation.

Proprietary or Patented Articles.—No substance which cannot be produced otherwise than under patented processes, or which is protected by proprietary rights, shall be introduced into the Pharmacopœia.

Nomenclature.—In the choice of titles of official articles it is recommended that convenience, established custom, and considerations of safety against mistakes, through similarity of or changes in names, should outweigh purely theoretical considerations or scientific preciseness.

Specific Gravity.—It is recommended that the Committee define the exact degree of temperature of the stand-

* In all 252.

ard by which other specific gravities are to be determined, and the specific gravities of the various official liquids shall be determined and stated by the Committee, so far as it may be practicable, on the basis of the established temperature and other conditions of the standard.

Weights and Measures.—It is recommended that the next Committee of Revision be instructed to direct solids to be weighed and liquids to be measured, and that the metric system be employed for this purpose.

General Formulæ.—It is recommended that general formulæ be introduced for fluid extracts, and such other preparations as have duplicate processes, and that the general formula to be followed in any particular case be merely indicated by reference.

List of Reagents, Tables, etc.—The tables and list of reagents authorized or prescribed for the Pharmacopœia of 1880 shall also be inserted in that of 1890, with such corrections or substitutions as may be required to bring them up to date.

Publication of the Pharmacopœia.—It is recommended that the Committee of Revision, etc., which will be elected by the Convention of 1890, be authorized to print and publish, on its own account, the Seventh Decennial Revision of the Pharmacopœia of the United States of America.

Date for the Pharmacopœia to go into Effect.—The Committee shall announce in a conspicuous place, in the printed work, a definite date, reasonably distant from the actual date of publication, when the new Pharmacopœia is intended to go into effect and to supersede the preceding one.

Compensation of Experts.—It is recommended that the Convention of 1890 instruct the Committee of Revision, etc., to pay the experts and others employed in the preparation and publication of the Seventh Decennial Revision of the Pharmacopœia.

Strength of Tinctures, Acids, etc.—The Committee of Revision is authorized, if in its judgment considered best, to make the strength of all official tinctures, wines, and dilute acids, ten per cent. In the case of dilute acids the strength to be ten per cent of the official acid and not of absolute acid. Infusions and decoctions to be five per cent instead of ten per cent as at present.

Preceding the discussion which took place upon the subject of weights and measures, the Convention listened for twenty minutes to an address by Prof. Hilgard, of the U. S. Coast Survey, in the course of which he described the history of federal legislation with regard to the adoption of standards for weight and mass. Fac-similes of the standard meter and kilogramme recently prepared by direction of the International Congress for establishing these standards, were shown, and the characteristic features of the standards themselves were described. In the discussion which followed it became evident that there is general dissatisfaction with the "parts by weight" system adopted for the revision of 1880, and, with but little dissent, it seemed desirable that parts by weight should be adopted for solids, and parts by measure for liquids, excepting such as, on account of their viscid or adhesive character, or some other reason, are better weighed than measured. The final vote by which this change was authorized and the metric system adopted for both was almost unanimous, the Southern and Western delegates being among the most enthusiastic.

With the exception of the last resolution (by Mr. Ebert), recommending a change in the strength of tinctures, wines, etc., the directions to the new Committee of Revision and Publication remain in almost the identical form in which they were presented by the Committee of 1880. Nearly all of them were discussed at length, and numerous amendments were offered, but finally the original text was accepted.

The following was adopted as the basis for the next decennial Convention:

Resolved, The President of the Convention shall, on or about the first day of May, 1899, issue a notice, requesting the several bodies represented in the Conventions of 1880 and 1890, and also such other incorporated State medical and pharmaceutical societies and incorporated colleges of medicine and pharmacy as have been in continuous operation for at least five years immediately preceding, to elect a number of delegates, not exceeding three, and the Surgeon-General of the Army, the Surgeon-General of the Navy, and the Surgeon-General of the Marine Hospital Service to appoint each not exceeding three medical officers, to attend a general Convention for the Revision of the Pharmacopœia of the United States, to be held in Washington, D. C., on the first Wednesday of May, 1900.

Resolved, The several bodies, as well as the medical department of the Army, Navy, and Marine Hospital Service thus addressed, shall also be requested by the President to submit the Pharmacopœia to a careful revision, and to transmit the result of their labors, through their delegates, to the Committee of Revision and Publication at least three months before the next meeting of the Convention.

Resolved, The several medical and pharmaceutical bodies shall be further requested to transmit to the President of this Convention the names and residences of their respective delegates as soon as they shall have been appointed; a list of whom shall be published, under his authority, for the information of the medical public, in the newspapers and medical journals in the month of March, 1900.

Resolved, In the event of the death, resignation, or inability of the President of the Convention to act, these duties shall devolve, successively, in the following order of precedence: upon the vice-presidents, the secretary, the assistant secretary, and the chairman of the Committee of Revision and Publication of the Pharmacopœia.

Resolved, That the Committee is authorized and directed to publish a supplement at the end of five years, if necessary.

Resolved, That the Committee shall report a complete plan for the revision of the Pharmacopœia at the next decennial Convention.

College of Pharmacy of the City of New York.—The sixtieth annual commencement of the college took place, before a very large and interested audience, at the Metropolitan Opera House on Tuesday evening, April 29th. The arrangements were perfect, and great credit is due to the Committee of Arrangements and to the class officers. The following is the list of graduates:

John P. Arnold, Gurdon S. Badger, Charles S. Bailey, Sumter L. Beegle, Carl Benkendoerfer, Charles T. Bischof, Hugo H. Braecklein, Samuel Brann, Hugo G. Braeunlich, Charles H. Brown, Lewis W. Brown, Marius A. Carpentier, Conrad G. Carver, Raoul R. D. Cline, May V. Crosby, William E. Dennis, Arthur L. Dickinson, Arthur Du Bois, Frederic D. Doolittle, Alphonse Dubus, Harry B. Epstein, William G. Everett, Robert Flaws, Jr., William C. F. Goerdes, Abram J. Hardenbergh, Jr., Oscar G. Harrison, William C. Hassler, Frederick C. Heckel, Louis F. Hiltz, Hormer H. Howgate, John J. Hubschmitt, Louis D. Huntoon, Eugene R. Hynard, Louis Ilse, William E. Jennings, August G. Jung, Gustave Katz, Joseph F. Keller, Rudolph G. Kellner, Louis J. Kocher, Hugo Kunz, James T. Lennon, Henry C. Lovis, James McCall, Joseph Moschowitz, Edward A. Mueller, Adolph Mund, Henry W. Nolte, William A. Orlich, Frederick Peiter, Earl F. Perry, Lavinius W. Peterson, Antonio Pisani, Hearn J. Power, Henry K. Preston, Leo Ratner, Arthur J. Reeder, Joseph E. Renton, Charles E. Rice, Jr., Frank W. Richtmyer, Charles R. Robinson, William J. M. Robinson, Walter S. Rockey, Charles H. Roese, Leo Rosenblum, John E. Ryan, James H. Scanlan, William Schroeder, Mowry Sheldon, James L. Shell, Norman H. Sipperly, Frank M. Small, Clarence I. Smith, Clarence P. Smith, Nelson P. Snow, Andrew G. Stafford, Edward Steeb, Abraham L. Stelle, Charles C. Stewart, Adolph Stierle, Jr., Louis Stuermer, Joseph Trostler, Louis H. Unbehaun, Dietrich W. Vogt, Harry W. Walp, Michael A. Walsh, Louis Warth, Le Roy Washburn, Grant J. Woolston, Isaac S. Zeman, Albert P. Zoller.

The alumni prizes were awarded to the following graduates:

First prize, gold medal, to John P. Arnold, who also received a special prize for excellence in pharmacy; second prize, silver medal, to Adolph Stierle, Jr.; third prize, bronze medal, to Wm. J. M. Robinson.

The valedictory was delivered in a very able and impressive manner by Louis F. Hiltz, and the address to the graduates by the Rev. Dr. John Hall, D.D., LL.D., Chancellor of the University of the City of New York.

Estimation of Fat in Sour Milk.—According to M. Kühn, the sour milk is just rendered alkaline with aqueous potash (40 Gm. in one liter of water), thereby dissolving the casein. Ten Gm. of the alkaline milk are poured on to a mixture of 25 Gm. of ignited gypsum, 4 Gm. of precipitated calcium carbonate, and 2 Gm. of potassium hydrogen sulphate, dried, ground up, and extracted in a Soxhlet's extractor. The addition of potassium hydrogen sulphate prevents the slight excess of alkali from saponifying the butter fat, while the calcium carbonate neutralizes the remainder of the potassium hydrogen sulphate.—*Milch-Zeit.* and *J. Chem. Soc.*

QUERIES & ANSWERS.

Queries for which answers are desired, must be received by the 5th of the month, and must in every case be accompanied by the name and address of the writer, for the information of the editor, but not for publication.

No. 2,435.—**Castile Soap** (Subscriber).

There is always some variation in the composition of so-called castile soap, though made by one and the same manufacturer. The best grades are made with the best commercial grades of caustic soda, and therefore contain but a small quantity of matter insoluble in alcohol. A recent analysis of some castile soap, published in the *Chem. and Drugg.*, gave the following composition:

Fatty Acids	64.80
Soda, in combination	8.60
Soda, uncombined	0.01
Sodium Carbonate	0.00
Sodium Chloride	0.40
Sodium Sulphate	0.14
Silica	0.00
Matter insoluble in water	0.70
Unsaponified Oil	0 00
Water	26.50
	101.15

The excess over 100 is due to the fact that the acids were not calculated as anhydrous.

No. 2,436.—**Shaving Soap** (M. E. S.).

A good shaving soap may be prepared as follows:

Melt 700 parts of pure lard in a porcelain vessel placed in a salt-water bath, or heated by steam, and very gradually add to it, under constant stirring, a solution of 97 parts of caustic potassa in 278 parts of water. When about half of the potassa solution has been added, the mixture begins to thicken, and gradually becomes so thick that it can no longer be stirred after all the alkaline solution has been added. The mass is now finished, but it is customary to impart to it a sort of mother-of-pearl gloss, which is done by triturating the soap in a mortar with a solution of 1½ parts of oil of bitter almond (or other essential oil) in 20 parts of alcohol, gradually added, and beating and mixing the mass thoroughly.

Another formula is the following, recommended by Dieterich:

Melt 12½ av. oz. of beef suet with 6 av. oz. of cocoanut oil at a temperature of 122° F., and add 10½ av. oz. of a solution of soda containing 25 per cent caustic alkali, and 1½ av. oz. of a like solution of potassa. Continue the heat at the above temperature for half an hour, stirring the mass constantly, or until it appears as a thin paste, then add to it a suitable perfume.

No. 2,437.—**Guenzburg's Reagent and Lind's Reaction.** (M. E. C.)

Our correspondent asks us what Lind's reaction is. Since the application of this has, of late years, become more universal through the fact that Guenzburg reversed it for the detection of hydrochloric acid, we have put the words "Guenzburg's Reagent" at the head of the query. This we have spoken of in previous issues; for instance, in our volume for 1888, pages 118, 146.

Lind's reaction has for object the detection of phloroglucin or of vanillin. If a piece of pine wood moistened with hydrochloric acid is brought in contact with a solution of phloroglucin, it assumes a red color. This is caused by vanillin, derived from the coniferin in the pine wood. The reaction may be made with vanillin direct by adding some phloroglucin to a small quantity of a freshly prepared solution of vanillin (vanillin 1 part, alcohol 100, water 100, strong hydrochloric acid 600 parts). The vanillin solution will turn red. This reaction is not given by the compounds even most closely related to phloroglucin. However, with orcin there is a light-blue solution produced, with a reddish hue. The reaction permits the recognition of as little as 0.001 Mgm. or $\frac{1}{1000}$ grain of phloroglucin.

Guenzburg found that by inverting the reaction it could be used for the detection of hydrochloric acid. For this purpose a solution of 2 Gm. of phloroglucin and 1 Gm. of vanillin in 30 Gm. of alcohol is employed. If a few drops of a liquid containing hydrochloric acid are mixed with a few drops of the reagent, and the whole gently heated over a flame, a crimson-red color will develop at the outer edge of the liquid, and this will gradually spread as the liquid dries up. The reaction is capable of revealing hydrochloric acid, even when highly diluted (1 in 20,000). Lactic acid does not produce the reaction, hence it may be used to demonstrate the presence or absence of hydrochloric acid in the gastric juice, and for this purpose it was first recommended by Dr. Germain Sée.

No. 2,438.—**"Cough Mixture"** (P.).

This subscriber wants us to send him a formula for a "cough mixture." While we do not, as a rule, approve of general formulæ for compound medicines to be used promiscuously for self-medication, yet we recognize that there is a popular demand for certain medicines required to treat simple cases. We may therefore state that, for general purposes, the officinal Brown Mixture (Mistura Glycyrrhizæ Co.), or Stokes' Expectorant Mixture, will probably be the most suitable. The formula of the latter will be found in the National Formulary under No. 89.

No. 2,439.—**Dobell's Solution** (F. R. E.).

This has the following composition:

Borate of Sodium (Borax)	120 grains.
Bicarbonate of Sodium	120 "
Carbolic Acid, crystallized	24 "
Glycerin	½ fl.oz.
Water	enough to make 16 "

Dissolve the salt in 8 fl.oz. of water, then add the glycerin, and the carbolic acid previously liquefied by warming, and lastly enough water to make 16 fl.oz.

It will be found in the National Formulary under No. 235 (Liquor Sodii Boratis Compositus).

No. 2,440.—**Sugar-coating Pills** ("Reader").

It is seldom that extemporaneously sugar-coated pills have a handsome appearance. This is usually accomplished only by employing special apparatus and working on a large scale. Consult Remington's "Practice of Pharmacy," page 1113, and AMERICAN DRUGGIST for 1889, page 153.

The sugar to be used must be in the finest possible powder (such as is sold as confectioner's sugar), and the pills must be perfectly dry exteriorly. Place the pills into a copper bowl—broad, shallow, round, and closed on top, with a handle—having first moistened the inside of the bowl with syrup, or with a mixture of syrup and mucilage. Roll the pills about by rotating the closed bowl over a flame. When they are uniformly coated, dust powdered sugar on them from time to time, and keep rotating and warming until the coating is dry, uniform, and smooth.

Another method, recommended by Hager, is as follows: Dissolve 1 part of white gelatin in 4 parts of distilled water by means of a water-bath. Make a mixture of 20 parts of sugar, 10 of starch, and 5 of tragacanth, and reduce it to the finest possible powder. Put about 2 heaped teaspoonfuls of this powder in a box, such as is used for silver coating; add about 25 drops of the warm gelatin solution, and then 50 of the pills to be coated. The pills must have been previously thoroughly dried, and, just before being put in the box, moistened with the gelatin solution. Now shake the box containing the pills, with a rotary motion, for about three minutes, and empty the contents upon a sieve. Separate the powder, replace the pills in the box, and keep rotating and shaking until the coating is smooth and glossy. If the coating is too thin, the pills must be taken out and dried before a new coating is put on.

Still another way consists in moistening the pills with a mixture of 1 part of glycerin and 2 parts of alcohol, and shaking them in a box with enough of a finely powdered mixture of 20 parts of sugar, 3 of arrowroot, and 1 of mastic. Sometimes this method is modified by dissolving 1 or 2 parts of mastic in the alcohol and glycerin.

No. 2,441.—**Syrupus "contre la Toux"** (C.).

This syrup or mixture is prescribed by a prominent physician of New York for children suffering from bronchitis. We are informed that it has the following composition:

℞ Syr. Ipecacuanhæ	2 fl. dr.
Spir. Æther. Nitr.	2 fl. dr.
Olei Ricini	3 fl. dr.
Syr. Tolutani	1 fl. oz.

M. "Shake the bottle before dispensing."

Dose—a small teaspoonful, according to the cough, every two to four hours.

No. 2,442.—**Prescription Query** (J. E. S.).

This subscriber states that he finds a reaction to occur when Aqua menthæ piperitæ and Spiritus ætheris nitrosus are mixed together. A gas is given off, according to his observation.

The cause of the evolution of the gas, in our opinion, is this, that our correspondent makes his peppermint water in the old way, viz., by rubbing the oil first with carbonate of magnesium, thus dissolving a small amount of this salt along with the oil in the water subsequently added. His spirit of nitrous ether is most likely—as usual—acid; hence, when the two liquids are poured together, the free acid of the spirit of nitre attacks the dissolved carbonate of magnesium, and carbonic acid gas is given off.

No. 2,443.—**Prices of Metals.**

Our correspondent will find a comparative list of prices of metals in our volume for 1886, page 35. The list there given enumerates only those which are usually obtainable in the market in quantities, varying, of course, according to the uses to which they are applied.

The prices of others are not fairly comparable with those used in the arts. Many of them are made only on a small

scale, for scientific purposes or for museum specimens, and are only prepared when there is a fresh demand for them. Some are very readily obtainable, and hence their value is small; others again are very rare, and troublesome to extract. Thus metallic selenium costs about $2.80 per ounce, while metallic gallium costs some $250 per gramme, equivalent to about $7,150 per ounce. Of course, the latter cannot be bought in such quantity in the market. The price lists of dealers in chemicals usually quote the rare metals.

No. 2,444.—**Separation of Animal or Vegetable from Mineral Oils** (J. E.).

This correspondent writes: "Can you give me a simple method of determining the *quantity* of animal or vegetable oil in a mixture of these with petroleum oils, as used in the manufacture of lubricating oils?"

The method of separating petroleum oils (so-called mineral oils) from animal or vegetable oils consists in subjecting the mixture to a process of saponification. Animal or vegetable oils, consisting of fatty acids in combination with glyceryl (the radical of glycerin), are perfectly saponifiable by alkalies (potassa or soda), and the resulting soap is soluble in water. Mineral oils are not saponifiable and are left unaltered. Yet when such a mixture is saponified, the mineral oil does not completely separate from the mixture, a portion of it being obstinately retained by the soap solution. That portion which is thus retained may be recovered by agitating the soap solution with ether. The latter will rise to the top—if the agitation was too violent, it will require a long time for separation—and may be poured off. This is repeated as long as ether extracts anything. The ethereal solution is then evaporated and the residue weighed. This is the mineral oil.

Another simple method is the following:

Into a beaker glass of suitable capacity put a weighed quantity of the suspected mixture of oils. Supposing it were 10 Gm.; now add to it 50 C.c. of an alcoholic solution of soda containing 80 Gm. of soda in 1 liter, and warm on a water-bath, continually stirring, for about twenty minutes, if necessary replacing some of the alcohol as it evaporates. If no sign of saponification has made its appearance, the oil is simply of mineral origin and contains no animal or vegetable oil. If saponification has taken place, add to the contents of the beaker some clean, dry and fine sand (about 100 Gm.), and evaporate off the alcohol, stirring constantly so as to obtain a thorough and intimate mixture of the partly or fully saponified residue with the sand. Dry this thoroughly. Now treat it with benzin (or ether), warming on a water-bath so that the solvent may be kept for a short time at a boil, and pour off the solution. Repeat this until a drop of the solution no longer leaves a permanent stain on blotting paper. Finally evaporate the benzin solution, and weigh the residue, which is the mineral oil.

The mixture of sand and saponified mass may also be removed from the beaker and extracted with benzin or ether in a Soxhlet or other kind of extractor. Of course this is much more economical, so far as menstruum is concerned.

2,445.—**American Soda by Solvay's Process** (Newark).

The Solvay process of manufacturing soda is carried on in the works at Geddes, near Syracuse, State of New York. It is said that these works will soon be able to supply almost the entire demand for alkali in this country.

The principle of the Solvay process is this: that when a current of carbonic acid gas is passed through a solution of common salt previously saturated with ammonia, the chloride of sodium is decomposed, chloride of ammonium being formed together with bicarbonate of sodium.

The salt solution is obtained from the rich salt beds which are situated not far from the works. Water is simply allowed to flow into the mine, and the brine is then pumped up.

Into this brine ammonia and carbonic acid are conducted. The solution soon becomes turbid from the separation of sodium bicarbonate. After a certain time, when it is known that this salt is no longer formed, the gas is shut off, the turbid solution run into filters, which retain the bicarbonate, and the clear liquid run off to tanks, where the ammonia is recovered by treating the mixture with milk of lime. The latter is obtained from caustic lime prepared on the spot by heating limestone in kilns. The carbonic acid given off thereby is used for saturating the brine. When the solution of chloride of ammonium is treated with the caustic lime, in form of milk, and heat is applied, the ammonia is given off and used over again for saturating brine. The ammonia therefore is, at least theoretically, not consumed, but used continuously. In practice, of course, there is a small loss. The final solution left after all ammonia has been distilled off contains calcium chloride, which is the only waste product.

The bicarbonate of sodium caught by the filters is dried and heated to expel one-half of the carbonic acid, which is likewise utilized again for saturating the first brine. The residual dry sodium carbonate is then dissolved in water and crystallized.

If caustic soda is wanted, it is heated with milk of lime, whereby calcium carbonate is precipitated and caustic soda remains in solution. The carbonic acid contained in the precipitated calcium carbonate is likewise recovered and utilized over again.

BIBLIOGRAPHY.

1. Les Plantes Médicinales indigenes et exotiques. Par Dujardin-Beaumetz et Egasse (pp. 900, with 1,084 illustrations). Giving the natural history, chemistry, botany, medicinal uses, etc., of the principal medicinal plants of all countries.

2. Traité des Alcaloides. Par B. Dupuy. In two very large volumes, containing a compilation of the essential data concerning the alkaloids so far known, particularly those which have been studied physiologically or clinically.

These volumes contain much information gathered from otherwise little accessible sources (chiefly from French ephemeral literature). At the same time the author has overlooked much information which might have been gleaned from foreign sources. Nevertheless, these works are of great usefulness.

Lessons in Qualitative and Volumetric Chemical Analysis. For the use of Physicians, Pharmacists, and Students. By Charles O. Curtman, M.D., etc. Including Dr. F. Beilstein's Lessons in Qualitative Chemical Analysis, Arranged on the Basis of the Last German Edition. Third Edition. Illustrated. St. Louis, Mo.: John L. Boland Book and Stationery Co., 1889. Pp. 200, 8vo (small).

We have already commended the features of former editions, from which it does not differ greatly.

A Manual of Chemistry for the Use of Medical Students. By Brandreth Symonds, A.M., M.D. Philadelphia: P. Blakiston, Son & Co., 1889.

This consists of an aggregation of the facts which it is considered desirable for the medical student of the present day to know. Their usefulness is not limited to the period of his college course, but relate to his daily life as a practitioner.

Proceedings of the American Pharmaceutical Association at the Thirty-seventh Annual Meeting, held at San Francisco, June, 1889, etc. Philadelphia, 1889. Pp. 850, 8vo.

This report increases in value as a work of reference, and becomes each year more indispensable for every pharmacist. The dealer in cigars and soda water who has a pharmaceutical annex will likewise find much in it that will be profitable reading.

The Calendar of the Pharmaceutical Society of Great Britain. 1890. Pp. 535, 8vo.

Of local interest only, but might serve as a model for similar publications in this country.

Spinal Concussion. By S. V. Clevenger, M.D., etc. With 30 Wood Engravings. Philadelphia: F. A. Davis, 1889. Pp. 359, 8vo. $2.50.

A form of nerve-disturbance, sometimes called "Erichsen's Disease," has long been recognized as a result of injuries resulting from falls and railroad collisions. Already the medico-legal questions involved have led to numerous writings on the subject, and a summary of the opinions and observations already expressed is needed. The author adds the results of his own experience.

A Laboratory Guide in Urinalysis and Toxicology. By R. A. Witthaus, A.M., M.D. Second Edition. New York: William Wood & Co., 1889. Pp. 75, 8vo.

This is purely a work for the pocket of a student in practical laboratory exercises, supplying the information requisite, and furnishing blank paper for notes and remarks.

A Manual of Organic Materia Medica. Being a Guide to Materia Medica of the Vegetable and Animal Kingdoms, for the Use of Students, Druggists, Pharmacists, and Physicians. By John M. Maisch, Ph.M., Phar.D. Fourth Edition, with 259 Illustrations. Philadelphia: Lea Brothers & Co., 1890. Pp. 539, 8vo.

In all respects the best hand-book of the kind published in this country.

Practical Electricity in Medicine and Surgery. By G. A. Liebig, Jr., Ph.D., and George H. Rohé, M.D. Profusely Illustrated. Philadelphia: F. A. Davis, 1890. Pp. 383, 8vo. $2.00.

This work seems to have been prepared with great care as regards details, and it is not open to the objection which obtains in many instances with works professing to be "practical," viz., that the only practical thing which seems to enter into their composition is the advertisement of the author. In the present state of electrical science there are many novelties for the student of twenty years ago, and the aid of a work like this will be essential to their comprehension.